TC-580

General Export Model

ISO

Set using ISO screws

SPECIFICATIONS

Power Requirements: AC 100 V, 110 V, 120 V, 127 V, 220 V or 240 V 50/60 Hz

Power Consumption: 90 W

Track System: 4-track stereophonic and monophonic

Reel Size: 7" (18 cm) maximum

Tape Speed: 7 1/2 ips, 3 3/4 ips, 1 7/8 ips (19 cm/s, 9.5 cm/s, 4.8 cm/s)

Recording Time (with 1,800 ft. tape):

Tape speed	4-track stereo	4-track mono
7 ½ ips (19 cm/s)	1.5 hrs	3 hrs
3 ¾ ips (9.5 cm/s)	3 hrs	6 hrs

Frequency Response: (with SONY SLH tape)
20 ~ 30,000 Hz at 7 1/2 ips (19 cm/s)
20 ~ 20,000 Hz at 3 3/4 ips (9.5 cm/s)
(with standard tape)
20 ~ 25,000 Hz at 7 1/2 ips (19 cm/s)
30 ~ 17,000 Hz at 3 3/4 ips (9.5 cm/s)
30 ~ 9,000 Hz at 1 7/8 ips (4.8 cm/s)

Signal-to-Noise Ratio: 56 dB (with SLH tape)
53 dB (with standard tape)

Flutter and Wow: 0.06 % at 7 1/2 ips (19 cm/s)
0.10 % at 3 3/4 ips (9.5 cm/s)
0.20 % at 1 7/8 ips (4.8 cm/s)

Recording Bias Frequency: Approx. 160 kHz

Inputs:
Two MIC Inputs
Impedance: low impedance
Maximum sensitivity: 0.2 mV (−72 dB)
Two AUX Inputs
Impedance: 100 kΩ
Maximum sensitivity: 0.06 V (−22 dB)
REC/PB connector
Impedance: 10 kΩ
Input level: 17.4 mV (−33 dB)

Outputs:
Two LINE Outputs
Load impedance: 100 kΩ
Output level: 0.775 V (0 dB)
HEADPHONE Output
Load impedance: 8 Ω
Output level: 12.5 mV (−36 dB) at 1 of level switch
31 mV (−28 dB) at 2 of level switch

Overall Distortion: 1.2 %

Semiconductors: 45 transistors, 1 integrated circuit, 27 diodes

Dimensions: 17 9/16" (W) x 8 7/8" (H) x 18 1/8" (D) (446 x 225 x 460 mm)

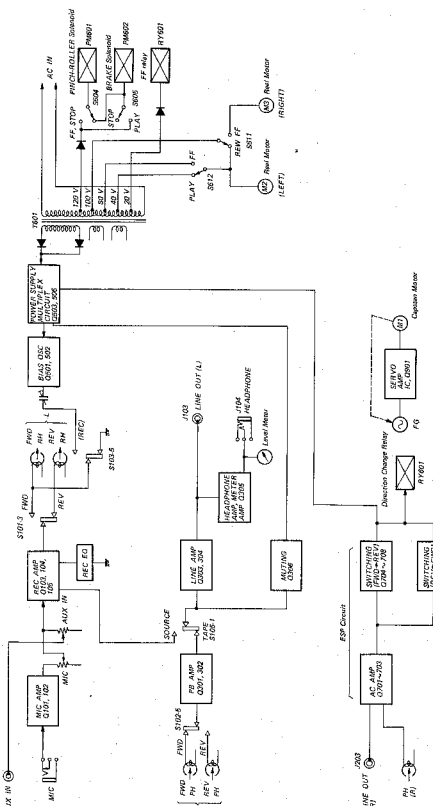
Weight: 43 lb (19.5 kg)

SONY®
SERVICE MANUAL

TABLE OF CONTENTS

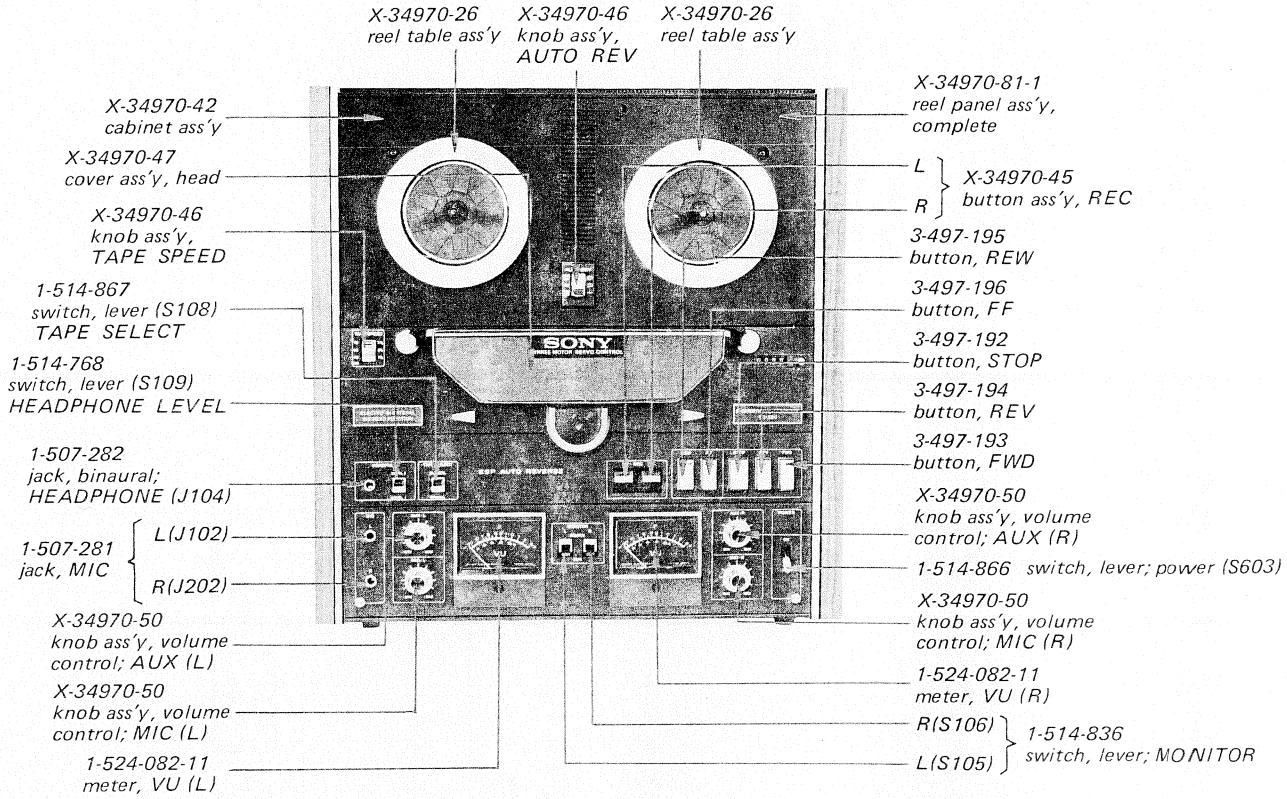
SECTION 1
GENERAL DESCRIPTION

1-1. BLOCK DIAGRAM

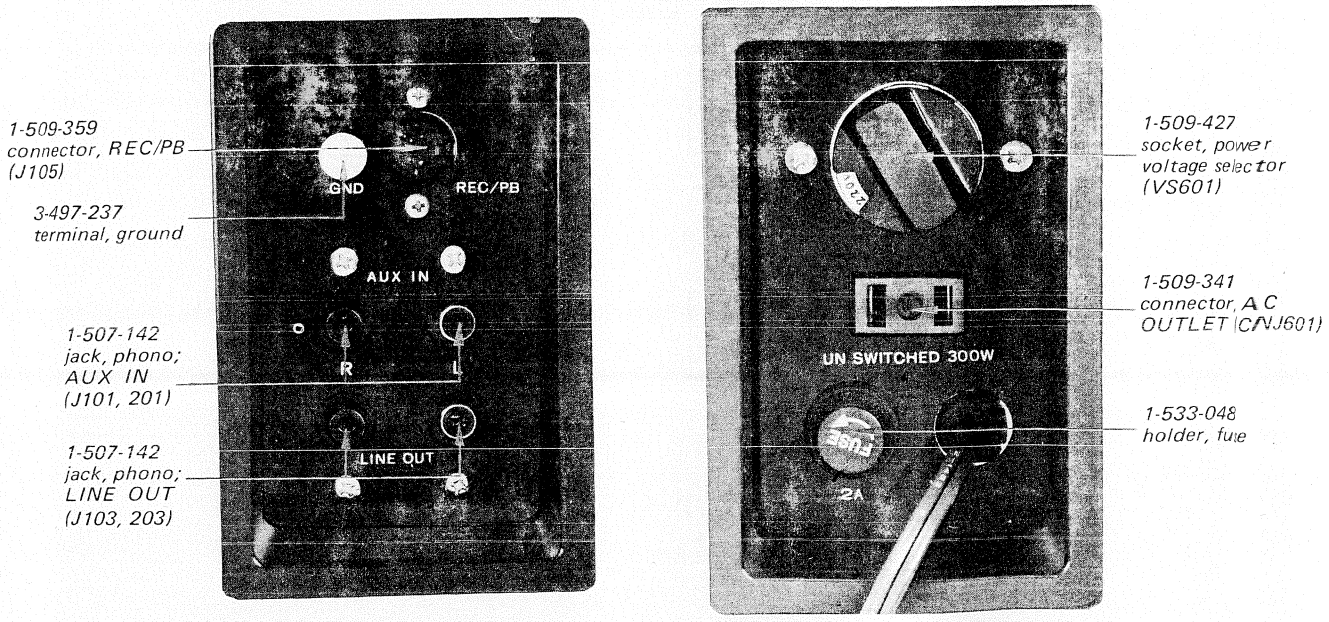


1-2. MAJOR PARTS LOCATIONS

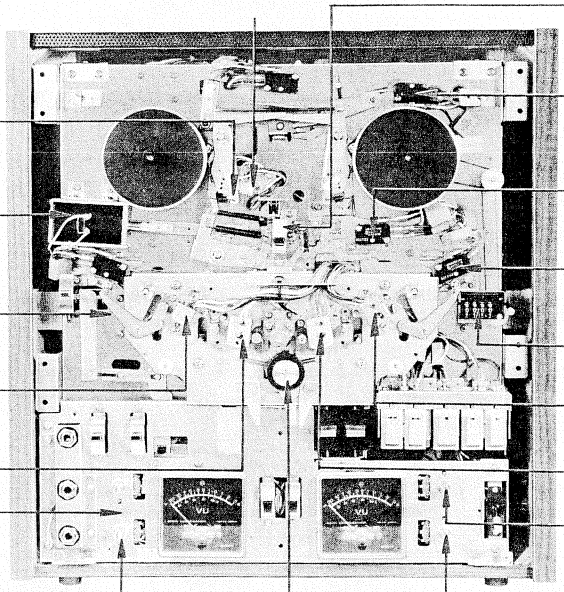
Cabinet — Top View —



Cabinet — Side Views —



Chassis — Top View —



1-514-706
switch, leaf;
PLAY-FF,STOP
(S613)

1-514-707
switch, leaf;
PLAY-FF,STOP
(S620)

1-454-075
solenoid, plunger
(PM601); PINCH ROLLER

1-514-864
microswitch,
AUTO SHUT-OFF (2)
(S618)

8-828-629-20
head, record/erase
(ERP102-2902)

8-829-142-20
head, playback
(PP102-4202)

1-222-497
resistor, variable;
30 kΩ (D), R131
(AUX-L)

1-514-864
microswitch, PLAY, FF-STOP
S614 (upper)
S605 (lower)

1-514-633
switch, lever; AUTO
REV (S617)

1-514-864
microswitch, PLAY-FF,STOP
S610 (upper)
S602 (lower)

1-514-864
microswitch, PLAY-FF, STOP
S604 (upper)
S612 (lower)

1-514-864
microswitch, AUTO (1)
SHUT-OFF (S609)

Y-20410-12-9
counter, tape index

8-828-629-20
head, record/erase
(ERP102-2902)

8-829-142-20
head, playback
(PP102-4202)

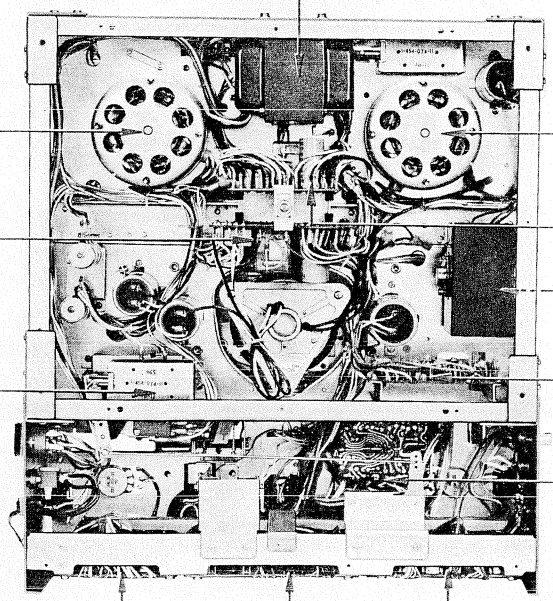
1-222-497
resistor, variable;
30 kΩ (D), R231
(AUX-R)

1-222-498
resistor, variable;
10 kΩ (D), R135
(MIC-L)

3-497-207
pinch roller

1-222-498
resistor, variable;
10 kΩ (D), R235
(MIC-R)

Chassis — Bottom View —



1-441-729
transformer, power

8-836-624-07
motor, UC-624K

X-34970-65
mounted circuit
board, power
supply

1-454-074
solenoid, plunger;
DIRECTION CHANGE
(PM603)

8-836-624-07
motor, UC-624K

X-34970-66
mounted circuit
board, relay

X-34970-68
mounted circuit
board, servo control

X-34970-67
mounted circuit
board, ESP

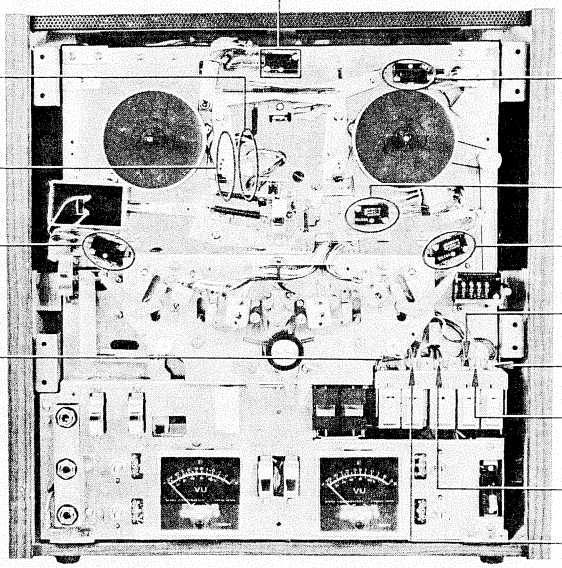
X-34970-62
mounted circuit
board, record equalizer

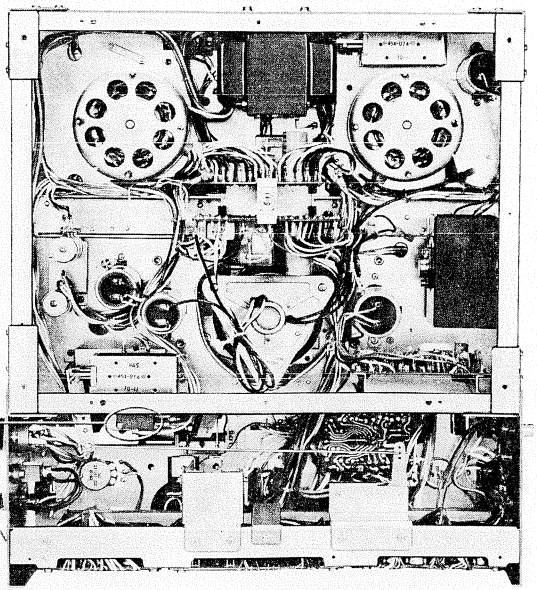
X-34970-61
mounted circuit
board, record
amp.

X-34970-64
mounted circuit
board, bias osc

X-34970-63
mounted circuit
board, playback amp.

1-3. SWITCH LOCATION





SECTION 2
DISASSEMBLY

2-1. Cabinet Removal

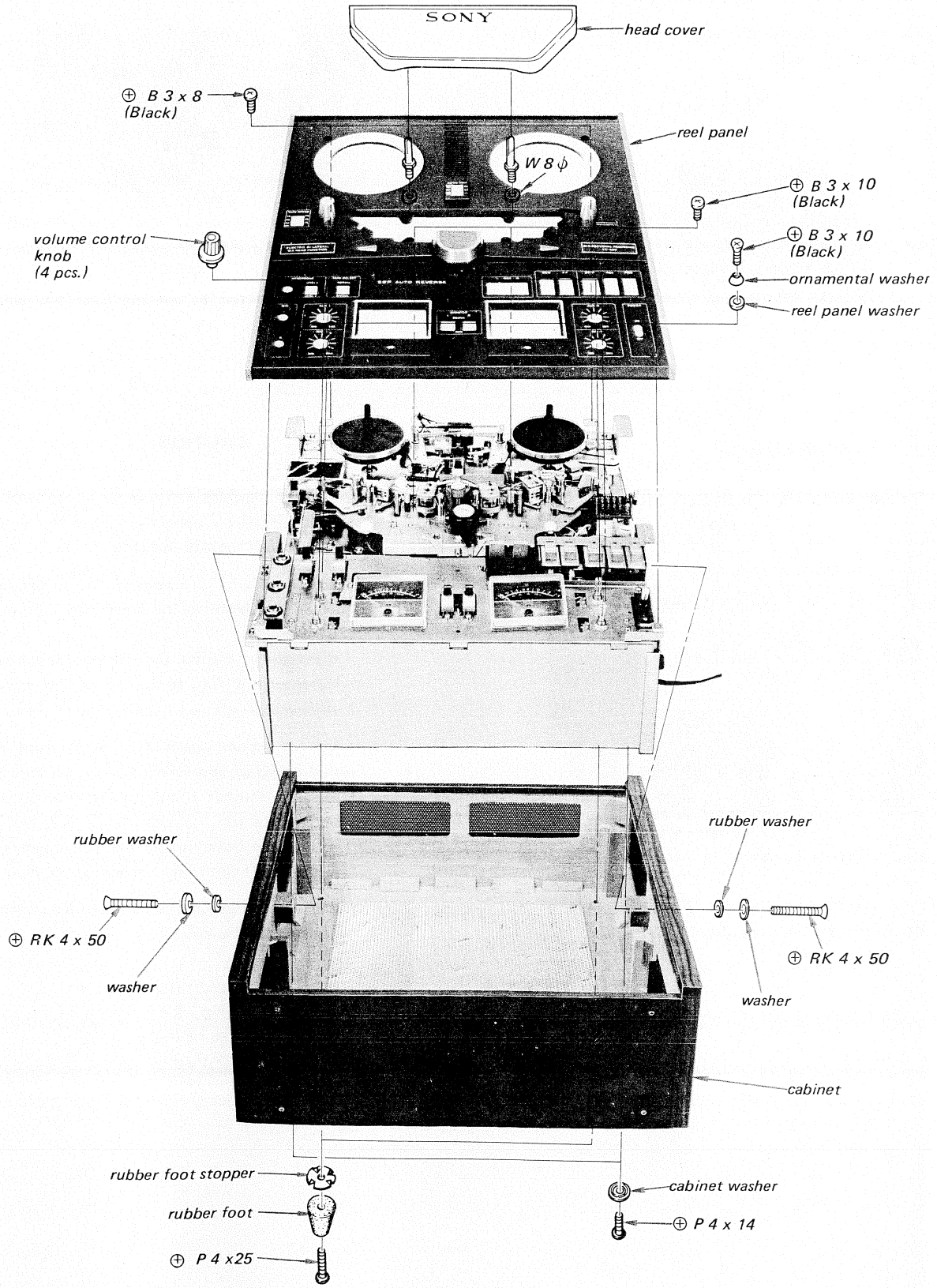


Fig. 2-1.

2-2. Head Deck Removal

1. Remove the FWD and REV lamps.
2. Remove the five screws shown in Fig. 2-2. Lift off the head deck.

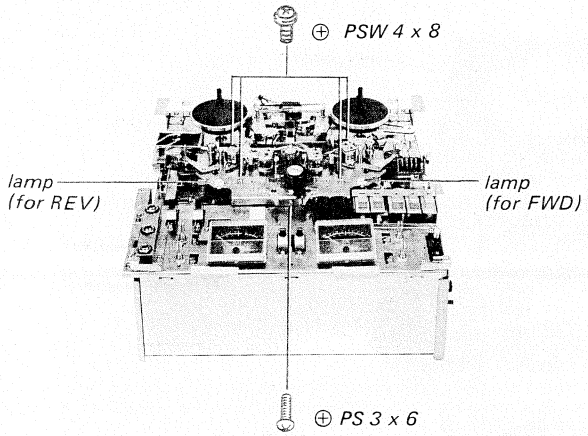


Fig. 2-2. Head deck removal

2-3. Record Equalizer Circuit Board Removal

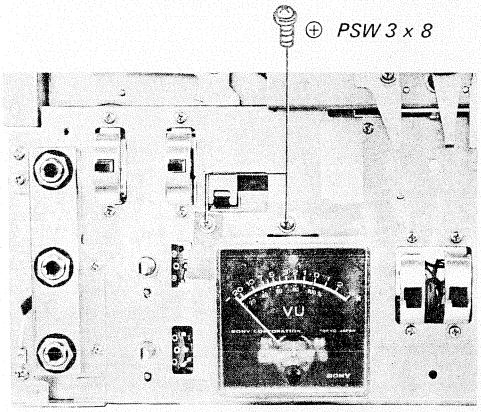


Fig. 2-3. Record equalizer circuit board removal

Note: After reattaching, make the equalizer switch (S107) position adjustment (See page 15).

2-4. Reverse Switch Circuit Board Removal

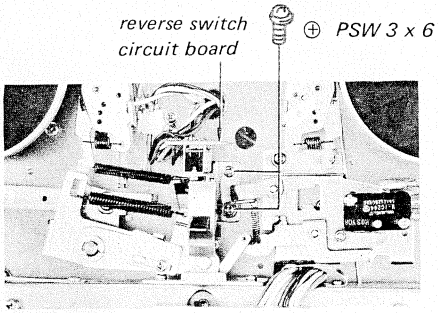


Fig. 2-4. Reverse switch circuit board removal

Note: Pay attention not to cut the head lead wires.

CAUTION:

1) Install the playback and bias osc. circuit boards, after the levers are perfectly hooked to the holes of the slider of the slide switches.
2) The lead wire of microswitch has a connector, which is connected to the other lead wire with a special jig.
   If the lead wire is cut or the connector is damaged, solder the lead directly to the microswitch terminal with an insulating tape wound around the terminal.
3) Never put the unit upside down on the hard plate with the head cover removed. The pin of the tape shifter, the shut-off arm pin, the tension arm and others will be bent because of the weight of the unit. If it is necessary to put the unit upside down, put it on a soft cloth with the head cover attached.
4) When replacing the chassis, cut threads on it with a hexagon tapping screw.

   Part No.
   *7-685-146-31 (for 3 mm dia.)
   ⊕ P 3 x 8
   *7-685-159-04 (for 4 mm dia.)
   ⊕ P 4 x 8

SECTION 3
ADJUSTMENT PROCEDURES

3-1. MECHANICAL ADJUSTMENTS

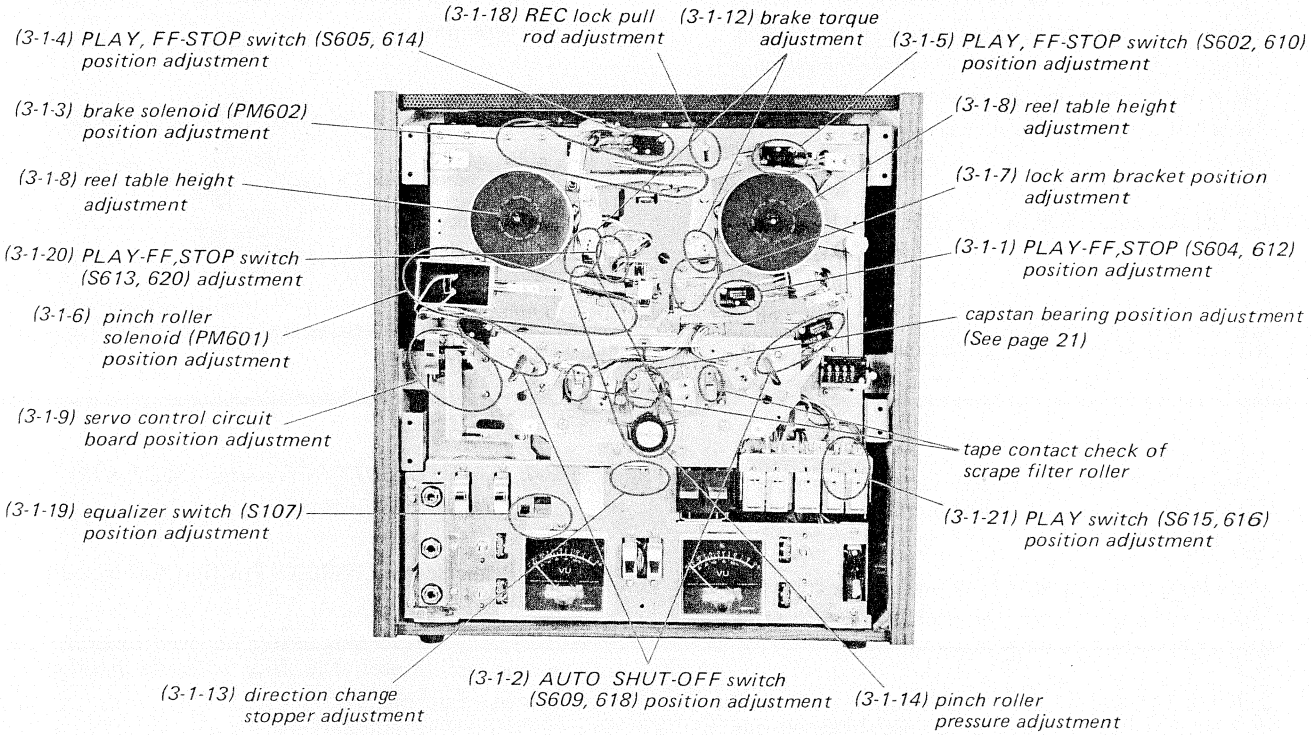


Fig. 3-1. Adjusting parts locations (1)

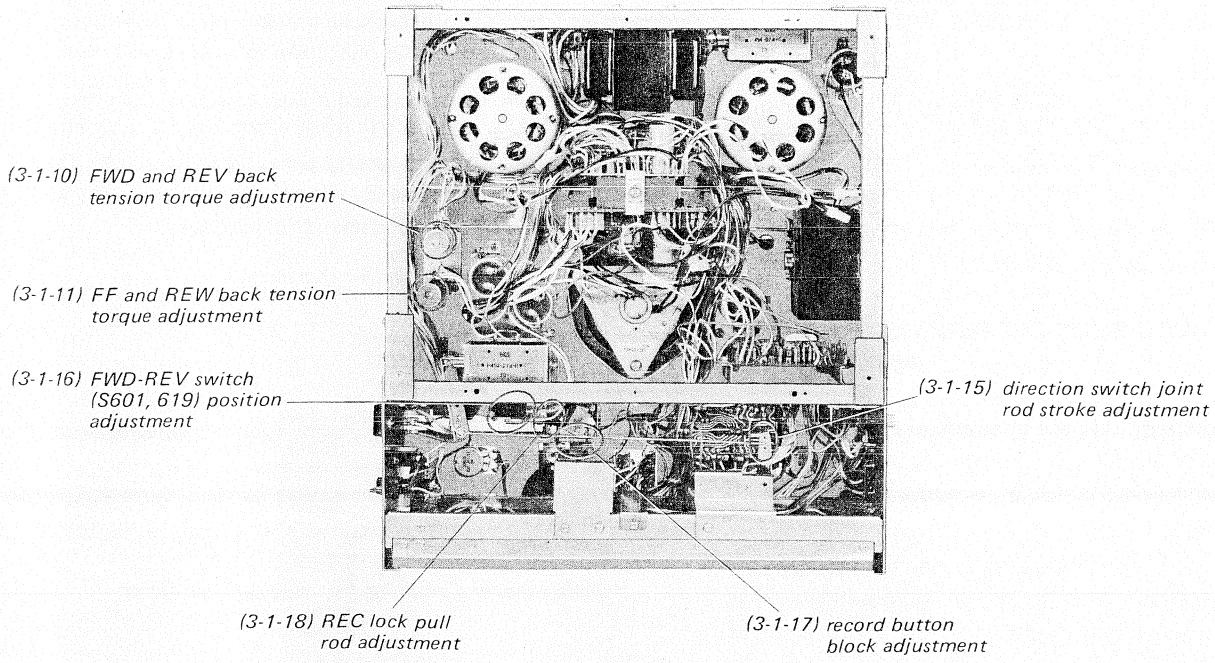


Fig. 3-2. Adjusting parts locations (2)

Note:

When the unit is set to FWD, REV, FF, REW, or REC mode with the no tape threaded, hold the both actuator pins so that the AUTO SHUT-OFF switch is activated (a rubber band or a piece of masking tape will hold the actuator as though tape were threaded on the unit).

3-1-1. PLAY-FF, STOP Switch (S604, 612) Position Adjustment

Make the following adjustments by loosening the two microswitch holding screws. See Fig. 3-3. After that, apply lock paint to them.

1. STOP mode (Lock arm B is locked)
   Make sure that the actuator of microswitch is perfectly pushed with the plate spring as shown in Fig. 3-3.
2. FWD or REV mode (Lock arm B is released.)
   The actuator of microswitch should not be pushed by the plate spring at all.
3. STOP to FWD (or REV) mode
   S604 should be released approximately one second after S612 is released.

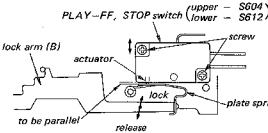


Fig. 3-3. PLAY-FF, STOP switch (S604, 612) position adjustment

3-1-2. AUTO SHUT-OFF Switch (S609, 618) Position Adjustment

1. Make sure that the bent portion of the actuator pin is positioned vertically against the chassis. If necessary, adjust by bending the base of the pin.
2. Loosen the two microswitch holding screws. Adjust the position of the microswitch so that the switch is turned ON by the actuator pin at the position shown in Fig. 3-4.
3. Apply lock paint to the screws.

Note:

Adjust for both AUTO SHUT-OFF switch in the same way.

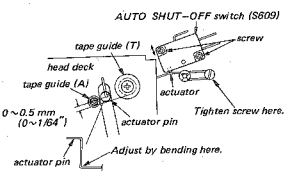


Fig. 3-4. AUTO SHUT-OFF switch (S609, 618) position adjustment

3-1-3. Brake Solenoid (PM602) Position Adjustment

1. Turn OFF the power. Unhook either end of the spring and loosen the four solenoid holding screws. See Fig. 3-5.
2. Push the solenoid shaft to the full with a hand in the direction shown by the arrow. Adjust the position of the solenoid so that the clearance between the timing lever and the lock lever is 0 to 0.5 mm (1/64"). Make this adjustment perfectly otherwise an unusual noise is produced because of the vibration of the brake lever.
3. Hook the spring again and turn ON the power. Change the mode from FWD (REV) to STOP and vice versa several times. Make sure that the unusual noise is not produced. Adjust the position of the solenoid, if necessary.
4. Apply lock paint to the screws.

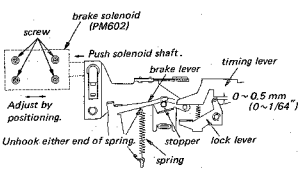


Fig. 3-5. Brake solenoid (PM602) position adjustment

3-1-4. PLAY,FF-STOP Switch (S605, 614) Position Adjustment

1. Place the unit in the FF or REW mode, to energize the brake solenoid. Check to see that the actuator of microswitch is perfectly pushed with the plate spring and also that the no clearance between the microswitch and the plate spring is obtained as shown in Fig. 3-6.
   If necessary, adjust the position of the microswitch by loosening the two switch holding screws.
2. Apply lock paint to the screws.

Note:

Be careful not to turn OFF the microswitch with the solenoid energized, as the thermistor (Pth601) on the relay circuit board will be damaged because of an unusual current.

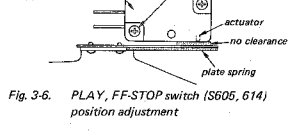


Fig. 3-6. PLAY, FF-STOP switch (S605, 614) position adjustment

3-1-5. PLAY,FF-STOP Switch (S602, 610) Position Adjustment

1. Place the unit in the FF or REW mode, to energize the brake solenoid. Check to see that the actuator of microswitch is perfectly pushed with the timing lever as shown in Fig. 3-7. If necessary, adjust the position of the microswitch by loosening the two switch holding screws.
2. Apply lock paint to the screws.

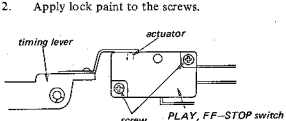


Fig. 3-7. PLAY, FF-STOP switch (S602, 610) position adjustment

3-1-6. Pinch Roller Solenoid (PM601) Position Adjustment

1. Loosen the three solenoid holding screws shown in Fig. 3-8.
2. Place the unit in the FWD or REV mode to energize the solenoid. Adjust the position of the solenoid so that the clearance between the pinch roller pressure adjusting plate and the plunger solenoid drive arm is 0.5 mm (1/64") to 1 mm (3/64"). Tighten the screws. The solenoid shaft should be attracted straight on the line and in parallel with the solenoid.
3. Apply lock paint to the screws.

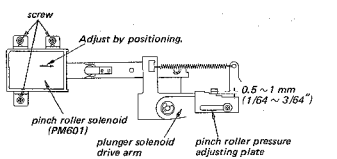


Fig. 3-8. Pinch roller solenoid (PM601) position adjustment

3-1-7. Lock Arm Bracket Position Adjustment

1. Make sure that the clearance between the lock arm (A) and the lock arm (B) is 0.5 — 1 mm (1/64 ~ 3/64") in the FWD (or REV) mode. In the STOP mode the clearance between the lock arm (A) and the lock arm (B) should be approximately 1 mm (3/64"). See Fig. 3-9.
2. Loosen the two lock arm bracket holding screws, if necessary. See Fig. 3-9.
3. Adjust the position of the lock arm bracket. Tighten the screws.
4. Apply lock paint to the screws.

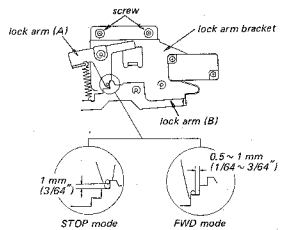


Fig. 3-9. Lock arm bracket position adjustment

3-1-8. Reel Table Height Adjustment

1. Use a 7 inch reel.
2. Thread the tape along the tape path. Place the unit in the FWD mode. If the tape touches either flange of the reel, adjust the reel table height by loosening the two set screws with an allen wrench. Here the both upper and lower clearances between the tape and the reel flange should be the same.
3. Tighten the set screws.

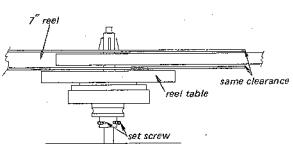


Fig. 3-10. Reel table height adjustment

3-1-9. Servo Control Circuit Board Position Adjustment

1. Loosen the two servo control circuit board holding screws shown in Fig. 3-11. Set the tape speed switch to the 9.5 cm/s (3-3/4 ips) position (center).
2. Thread the tape along the tape path. Place the unit in the FWD mode. Adjust the position of the servo control circuit board together with the heat sink so that the TAPE SPEED is 9.5 cm/s. Tighten the screws.
3. Make sure that the tape speed changes definitely, when the TAPE SPEED switch is slowly changed to the 4.8 cm/s, 9.5 cm/s and 19 cm/s positions. Readjust the position of the servo control circuit board, if necessary.
4. Apply lock paint to the screws.

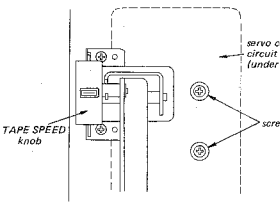


Fig. 3-11. Servo control circuit board position adjustment

3-1-10. FWD and REV Back Tension Torque Adjustment

Note:

Instructions in [ ] are applied to the REV back tension torque adjustment.

1. Place a 7" reel with string wound several turns counterclockwise [clockwise] onto the FWD [REV] supply reel table. Tie the string to the spring scale.
2. Measure the back tensions by pulling the 0 to 400 g (14 oz) spring scale at approximately 9.5 cm/s (3-3/4 ips) speed in FWD [REV] mode. See Fig. 3-12.
   It should be 200 to 240 g·cm (2.78 to 3.32 oz. inch).
3. Adjust the slider of R609 by loosening the screws, if necessary.

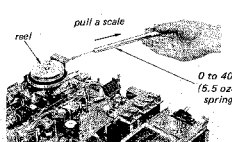


Fig. 3-12. FWD and REV back tension torque adjustment

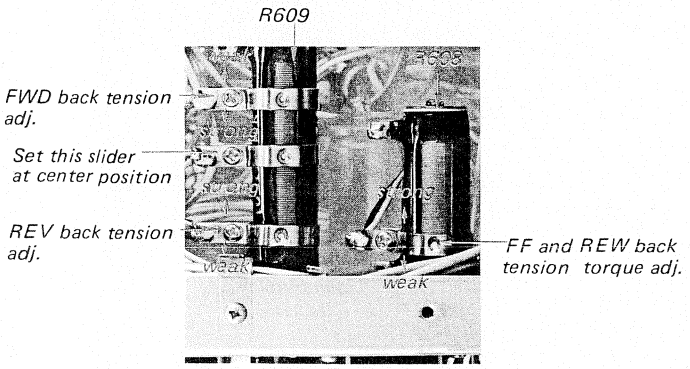


Fig. 3-13. Back tension torque adjusting parts location

3-1-11. FF and Rewind Back Tension Torque Adjustment

Note:
Instructions in [ ] are applied to the REW back tension adjustment.

1. Place a 7″ reel with string wound several turns counterclockwise [clockwise] on the hub onto the FWD [REV] supply reel table. Tie the string to the spring scale.
2. Measure the back tension by pulling the 0 to 400 g (14 oz) spring scale at approximately 9.5 cm/s (3-3/4 ips) speed in FF [REW] mode. See Fig. 3-12. It should be 60 to 80 g·cm (0.83 to 1.1 oz inch).
3. Adjust the slider of R608 by loosening the screw, if necessary.

3-1-12. Brake Torque Adjustment

This adjustment should be performed for both supply and take-up sides.

Note:
Instructions in [ ] are applied to the take-up brake torque adjustment.

1. Place the unit in the STOP mode.
2. Place a 7″ reel with string wound several turns counterclockwise [clockwise] on the hub onto the reel table. Tie the string to a spring scale.
3. Pull the scale in the direction shown by the red arrow, making sure that the string does not touch either flange of the reel. The reel table will rotate counterclockwise [clockwise]. Take a reading only when the reel table is in steady motion.
4. The scale reading should be 900 g·cm (12.5 oz·inch) to 1,200 g·cm (16.7 oz·inch).
5. Rewind the string by turning the reel clockwise [counterclockwise].
6. Turn string several times clockwise [counterclockwise] on the hub onto the reel table.
7. Pull the scale in the direction shown by the black arrow, making sure that the string does not touch either flange of the reel.
   The reel table will rotate clockwise [counterclockwise]. Take a reading only when the reel table is in steady motion.
8. The scale reading should be 300 g·cm (4.17 oz·inch) to 400 g·cm (5.55 oz·inch)
9. If the satisfied results are not obtained, adjust by changing the hooking position of spring.

Specification:

Brake Torque of Supply Reel
in clockwise turning . . . . . 300–400 g·cm (4.17–5.55 oz·inch)
in counterclockwise turning . . . . . 900–1,200 g·cm (12.5–16.7 oz·inch)

Brake Torque of Take-up Reel
in clockwise turning . . . . . 900–1,200 g·cm (12.5–16.7 oz·inch)
in counterclockwise turning . . . . . 300–400 g·cm (4.17–5.55 oz·inch)

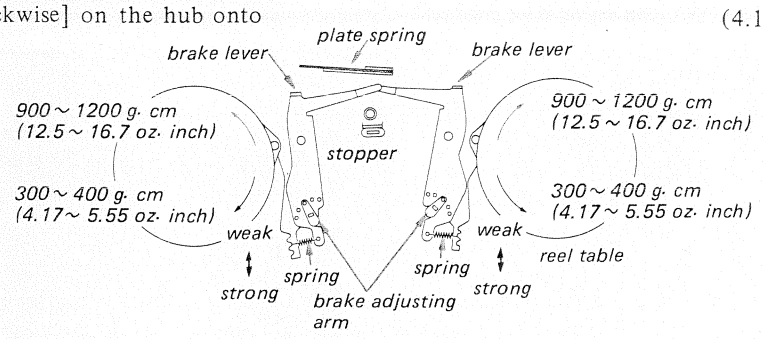


Fig. 3-14. Brake torque adjustment

3-1-13. Direction Change Stopper Position Adjustment

1. Loosen the stopper holding screw.
2. Place the unit in the FWD (or REV) mode. Adjust the position of the direction change stopper so that the clearance between the stopper and the tape direction change lever is 4 mm (5/32").
3. Change the mode from FWD to REV and vice versa several times. Make sure that the position of the pinch roller changes when the mode is changed.
4. Apply lock paint to the screws.

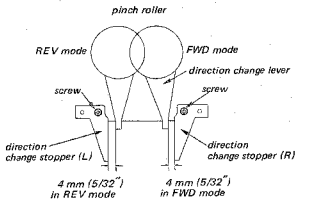
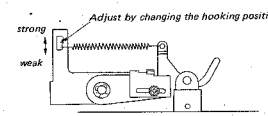


Fig. 3-15. Direction change stopper position adjustment

3-1-14. Pinch Roller Pressure Adjustment

1. Make a loop in a piece of string and attach the 0 to 1,600 g (3 lb 8 oz) spring scale around the base of the pinch roller shaft. See Fig. 3-16. Pull the scale. The pulling direction should be aligned with the pinch roller shaft and the capstan. Check the reading when the pinch roller just stops rotating. It should be 1,200 to 1,400 g (42 to 49 oz). If necessary, change the hooking position of the spring.



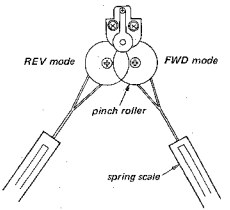


Fig. 3-16. Pinch roller pressure adjustment

3-1-15. Direction Switch Joint Rod Stroke Adjustment

1. Place the unit in the STOP mode. Push the tip of the direction switch lever slowly in the direction shown by the arrow in Fig. 3-17 as far as the slide switches on the playback and the bias osc. circuit boards are changed. (Do not move the position of switch).
2. Push the REV button. Make sure that the tip of the lever is pushed moreover by 0.5~1 mm (1/64~3/64") in the direction shown by the arrow by the solenoid.
3. Change the mode from the FWD to REV and vice versa several times and make sure that the slide switches are changed perfectly.
4. Change the position of direction switch joint rod to the direction change lever if necessary.

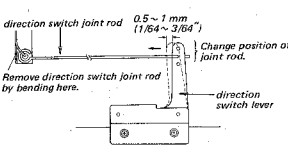


Fig. 3-17. Direction switch joint rod stroke adjustment

3-1-16. FWD-REV Switch (S601, 619) Position Adjustment

1. Loosen the two screws.
2. Place the unit in the REV mode to energize the direction change solenoid.
3. Adjust the position of the microswitch so that the actuator is perfectly pushed with the joint plate. Tighten the screws.
4. Apply lock paint to the screws.

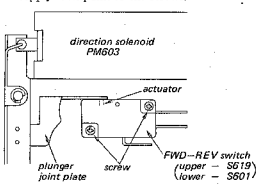


Fig. 3-18. FWD/REV switch (S601, 619) position adjustment

3-1-17. Record Button Block Adjustment

1. See Fig. 3-19. Place the unit in the STOP mode. Check to see that the clearance between the REC button block and the record arm holder is 0.5 (1/64") to 1 mm (3/64"). If necessary, adjust the position of the REC arm holder by loosening the screws.
2. Make sure that the slide switches (S103, 104) on the bias circuit board are perfectly switched, when the REC button is locked. Readjust the clearance between the REC button block and the REC arm holder, if necessary.
3. Apply lock paint to the screws.

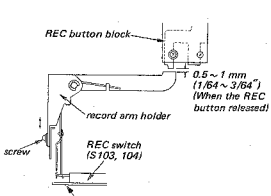


Fig. 3-19. Record button block adjustment

3-1-18. REC Lock Pull Rod Adjustment

1. Place the unit in the STOP mode. Turn the split nut clockwise until the tip of the REC lock pull rod is in contact with the REC lock rod. Moreover, turn the split nut slowly one or two times after the tip of the pull rod is in contact with the REC lock rod. Press the nut by using a pliers.
2. Make sure the followings.
   a) Lock the REC button in the STOP mode. The REC button is released when the FWD or REV button is pushed.
   b) Lock the REC button slowly in the STOP mode. The REC lamp lights before the button is locked.
   c) Lock one of the two REC buttons in the STOP mode. The button is released when another is locked.
3. Apply contact cement to the nut.

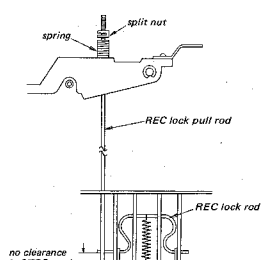


Fig. 3-20. REC lock pull rod adjustment

3-1-19. Equalizer Switch (S107) Position Adjustment

1. Loosen the two screws as shown in Fig. 3-21. Set the tape speed switch to the 9.5 cm/s (center) position.
2. Move the screws so that the equalizer switch is set at the 9.5 cm/s (center) position.
3. Change the tape speed switch to the 4.8 cm/s, 9.5 cm/s and 19 cm/s positions and vice versa several times. Make sure that the equalizer switch is definitely changed.
4. Apply lock paint to the screws.

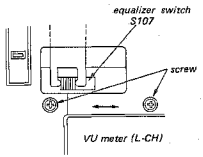


Fig. 3-21. Equalizer switch (S107) position adjustment

3-1-20. PLAY–FF, STOP Switch (S613, 620) Position Adjustment

1. Place the unit in the STOP mode. See Fig. 3-22. Make sure that the distance between the plunger joint plate and the leaf A of the leaf switch is 0 to 0.5 mm (1/64"), and also that the leaves A and B are in contact with each other completely. If necessary, adjust the switch position by loosening the screws.
2. Place the unit in the FWD (or REV) mode, to energize the pinch roller solenoid. Make sure that the leaves A and C are perfectly in contact with each other.
3. Apply lock paint to the screws.

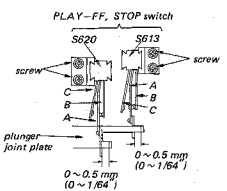


Fig. 3-22. PLAY-FF, STOP switch (S613, 620) position adjustment

3-1-21. PLAY Switch (S615, 616) Position Adjustment

1. Make sure that S615 (S616) is turned ON when the FWD (or REV) button is pushed and also that it is turned OFF when the button is released. If necessary, adjust the position of PLAY switch S615 (or S616) by loosening the screw A (or screw B) in Fig. 3-23. Make sure that the switch is not turned ON by the play of the FWD button.
2. Apply lock paint to the screws A and B.

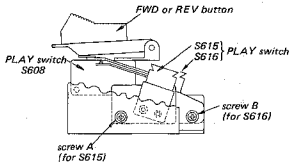


Fig. 3-23. PLAY switch (S615, 616) position adjustment

3-1-22 Adjustments after Head Replacement

For FWD Direction

When replacement of more than two heads are required, leave one of them unremoved for the reference of adjustments. Do not remove all the heads at the same time.

A) Playback Head Replacement

1. Replace the playback head by removing the angle adjusting screws. See Fig. 3-26. Do not move the height and zenith adjusting screws.
2. Play back the alignment tape (J-19-A 2). Make the azimuth and angle adjustments. See page 23.
3. Paint the head core with black ink as shown in Fig. 3-24.

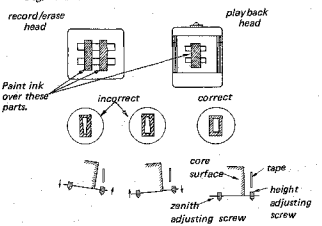


Fig. 3-24. Head zenith and height adjustment

4. After the ink dried, run the tape in the FWD direction for 20 to 30 seconds. Watch the ink on the core fading away. When the same wide amount of the faded away part cannot be obtained at every point, turn the zenith and height adjusting screws in the direction shown by the arrows. See Fig. 3-24.
   Repeat this step several times until the satisfied result is obtained. After the adjustment clean the core with a soft cloth dampened with denatured alcohol.

5. For the record head tracking adjustment, connect a VTVM and a 100 kΩ resistor in parallel with the LINE OUT jack, deliver the 1 kHz signal (−60 dB) to the MIC jack. Set the MONITOR switch to the TAPE position. Place the unit in a normal stereo record mode. Turn the record head zenith and height adjusting screws in the same amount of the same direction so that the same maximum output can be obtained at both channels.

6. Play back the alignment tape (J-19-A2), and make the playback azimuth adjustment again.

7. Make the playback level and equalizer adjustments. See page 23 and 24.

8. Apply lock paint to the adjusting screws.

B) Record/Erase Head Replacement

1. Remove the azimuth adjusting screw and the head holding screw (with spring). Replace the head with the mounting plate. Do not move the zenith and height adjusting screws.

2. Make the record head azimuth adjustment. See page 25.

3. Paint the record/erase head cores with ink as shown in Fig. 3-24.

4. After the ink dried, run the tape in the FWD direction for 20 to 30 seconds. Watch the ink on the core fading away. When the ink does not fade away in the same wide amount at every point, turn the zenith and height adjusting screws in the direction shown by the arrows. See Fig. 3-24. Repeat this step several times until the satisfied result is obtained. After adjustment clean the cores with a soft cloth dampened with denatured alcohol.

5. Make the record head azimuth adjustment again. See page 25.

6. Make the record head track adjustment. See page 25.

7. Make the record bias adjustment, overall frequency response and erase ratio Measurement.

8. Make sure that the positioning relation between the head core and the tape is correct. See Fig. 3-25.

9. Apply lock paint to the adjusting screws.

For REV Direction

The tape guide (4), which is used for the REV tape path adjustment, should not be adjusted in the head replacement.
The adjustments after playback and record/erase head replacement are the same in procedure as in the FWD head replacement.

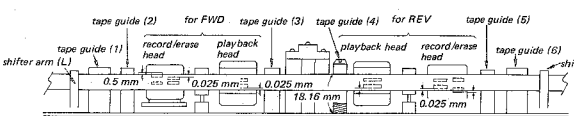


Fig. 3-25. Head adjustment

Checks After Mechanical Adjustment

1. Torque Check

   FWD, REV torque ... more than 200 g. cm (2.78 oz. inch)

   FF, REW torque ..... more than 100 g. cm (1.39 oz. inch)

   FWD, REV back tension ..... 200 – 240 g. cm* (2.78–3.32 oz. inch)

   FF, REW back tension ..... 60 – 80 g. cm* (0.83–1.1 oz. inch)

   * : adjustable

2. After making adjustments, clean the following parts with a soft cloth dampened with denatured alcohol; head core, tape guide, pinch roller, scrape filter roller, brake contact part of the reel table.

3. Tape Contact Check of Scrape Filter Roller

   a) Thread a 7-inch tape along the tape path and set the tape speed switch to the 4.8 cm/s position.

   b) Run the tape. Make sure that the scrape filter roller is rotating. Stop the roller by fingers. Make sure that the roller starts rotating again when taking off the fingers from the roller. If necessary, adjust the position of the scrape filter roller by loosening the screw.

4. Wow and Flutter Measurement
   Make measurements at the beginning and the end of the tape. The measurement may be done with the unit set to either FWD and REV mode.

*At 19 cm/s (7-1/2 ips) and 9.5 cm/s (3-3/4 ips) tape speed

Steps

(1) Connect a wow meter and a 100-kΩ resistor in parallel with the LINE OUT jack.

(2) Set the MONITOR switch to TAPE.

(3) Play back the alignment tape indicated below.

(4) Make sure that the satisfied result is obtained on the wow meter.

tape speed	specification	remarks
19 cm/s (7-½ ips)	less than 0.12 % (RMS)	Play back SONY alignment tape WS-19-7
9.5 cm/s (3-¾ ips)	less than 0.15 % (RMS)	Play back SONY alignment tape WS-9-7

*At 4.8 cm/s (1-7/8 ips) tape speed

Steps

(1) Set the record volume controls to the position specified in Precaution (8) on page 19.

(2) Connect a wow meter and a 100-kΩ resistor in parallel with the LINE OUT jack.

(3) Set the MONITOR switch to TAPE.

(4) Deliver a 3-kHz signal of -60 dB (-10 dB) to the MIC (AUX) jack.

(5) Record the signal on the blank tape.

(6) Make sure that the satisfied result is obtained on the wow meter.

Specification : less than 0.40 % (RMS)

3-2. ELECTRICAL ADJUSTMENTS

Precaution:

Before making adjustment, make sure to read the following carefully.

(1) Equipment to be required are as follows:

Audio oscillator (AF OSC)
Attenuator (ATT)
VTVM
Oscilloscope
Digital frequency counter
SONY alignment tape
*J-19-A2 (for head azimuth and angle adj.)
*J-19-F2 (for 19cm/s level and equalizer adj.)
*J-9-F1 (for 9.5 cm/s level and equalizer adj.)
*SPC-47 (for tape speed adj.)
Fixed resistors
600 Ω, 300 Ω, 10 kΩ, 100 kΩ

(2) SONY alignment tapes contain the following information in the sequence indicated.

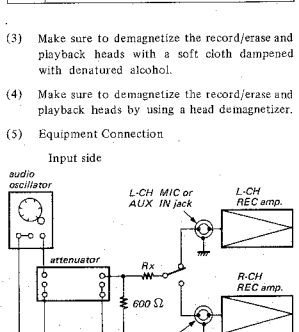
Tape name	1st	2nd	3rd	4th	5th	6th	7th
J-19-A2	12.5 kHz, −10 dB						
J-19-F2	400 Hz 0 dB	400 Hz −10 dB	10 kHz −10 dB	12.5 kHz −10 dB	3 kHz −10 dB	80 Hz −10 dB	40 Hz −10 dB
J-9-F1	5 kHz −10 dB	400 Hz 0 dB	400 Hz −10 dB	5 kHz −10 dB	3 kHz −10 dB	200 Hz −10 dB	80 Hz −10 dB
SPC-47	4 kHz, 0 dB						

(3) Make sure to demagnetize the record/erase and playback heads with a soft cloth dampened with denatured alcohol.

(4) Make sure to demagnetize the record/erase and playback heads by using a head demagnetizer.

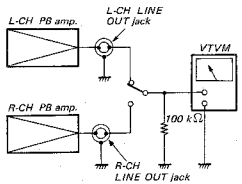
(5) Equipment Connection

Input side



Input	Rx
MIC	0 Ω
AUX IN	10 kΩ

Output side



(6) Input and output levels are specified as follows, unless otherwise specified.

Normal input level

	MICRO-PHONE	AUX IN
Signal source impedance	300 Ω	10 kΩ
Input signal level	−60 dB (0.775 mV)	−10 dB (0.245 V)

Normal output level

	LINE OUT
Load resistor	100 kΩ
Output level	0 dB (0.775 V)

(7) The switches should be set to the following position, unless otherwise specified.

*TAPE SPEED ——— 19cm/s (7½ ips)
*TAPE SELECT ——— NORMAL
*AUTO REV ——— NON REV

(8) The record volume controls should be set to the following position, unless otherwise specified.

*MIC volume control (In using the MIC jack)
Turn the AUX volume controls fully counterclockwise, set the MONITOR switch to SOURCE and deliver a 1 kHz signal of −60 dB (0.775 mV) to the MIC jack. Adjust the MIC volume controls so that the VTVM reads 0 dB (0.775 V).

*AUX volume control (In using the AUX IN jack)
Turn the MIC volume controls fully counterclockwise, set the MONITOR switch to SOURCE and deliver a 1 kHz signal of −10 dB (0.245 V) to the AUX IN jack. Adjust the AUX volume controls so that the VTVM reads 0 dB (0.775 V).

(9) The adjustments should be performed in the sequence, unless otherwise specified.

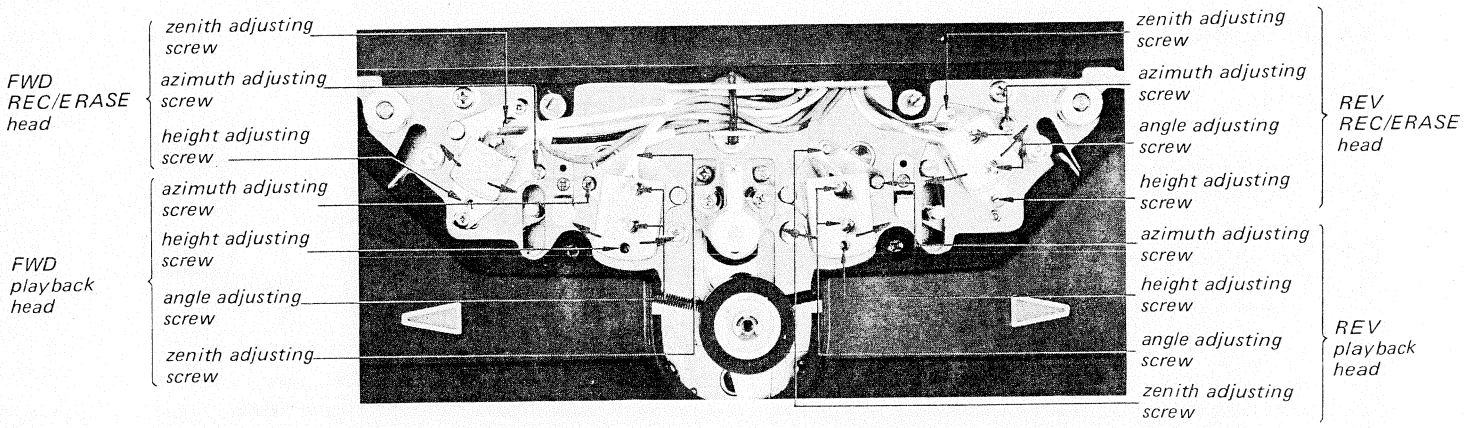


Fig. 3-26. Adjusting parts location (1)

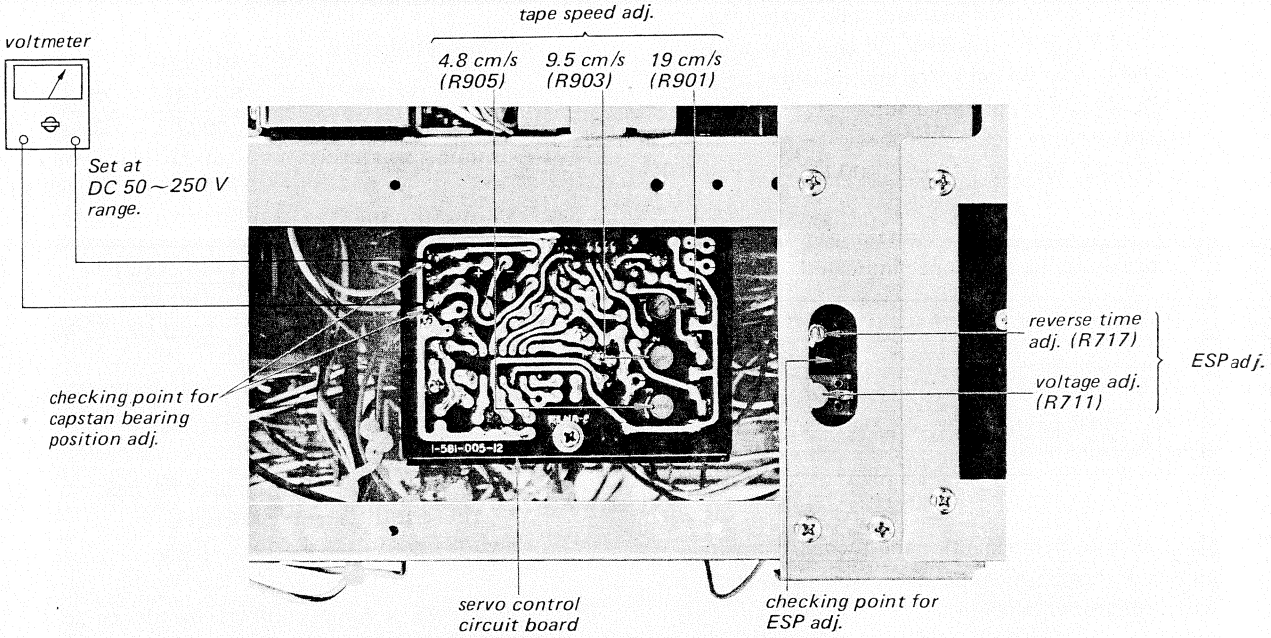


Fig. 3-27. Adjusting parts location (2)

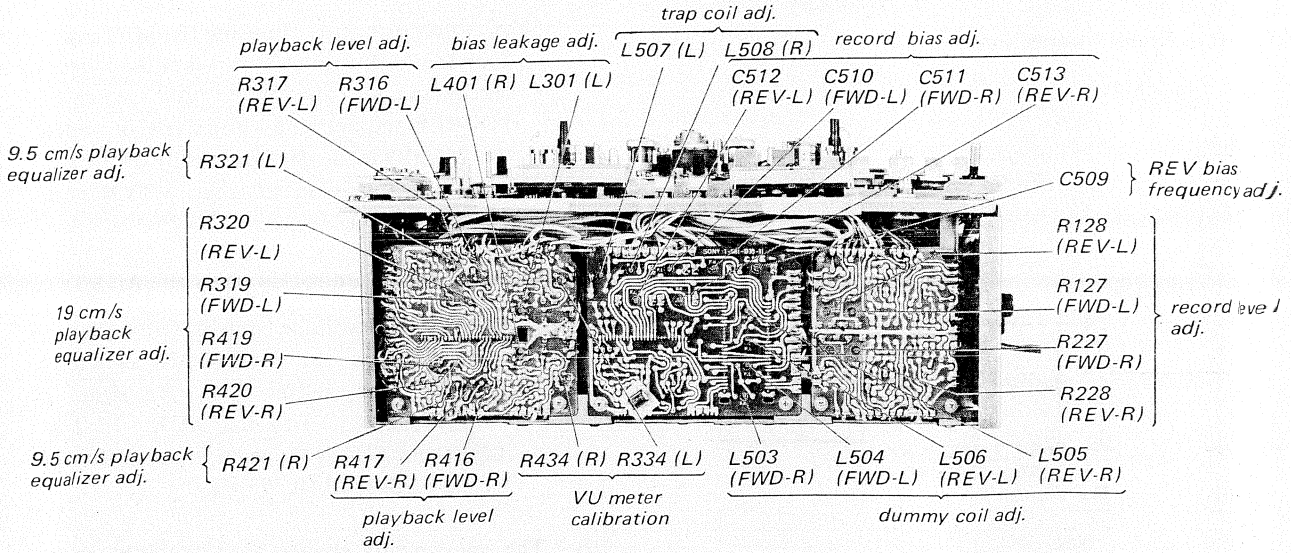
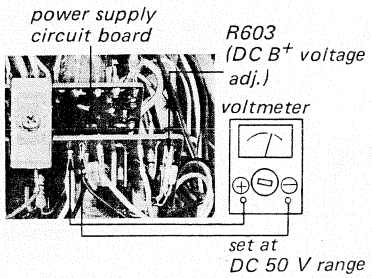


Fig. 3-28. Adjusting parts location (3)

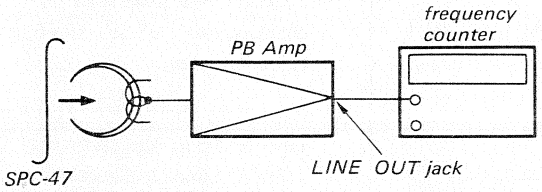
<table>
<tr><th>Items</th><th>Remarks</th><th>Procedures</th></tr>
<tr><td>1. DC B + Voltage Adjustment</td><td>Test Setup:
 

Specification: 24 ± 0.5 V

Note: Make sure that ac power source voltage is correct.</td><td>(1) Place the unit in the STOP mode.

(2) Adjust R603 to obtain 24 ± 0.5 V on the voltmeter (20 kΩ/V).

CAUTION:

Do not short-circuit between B^+ circuit and ground, or transistor Q602 will be broken.</td></tr>
<tr><td>2. Tape Speed Adjustment</td><td>Test Setup:
 

Switch Setting:

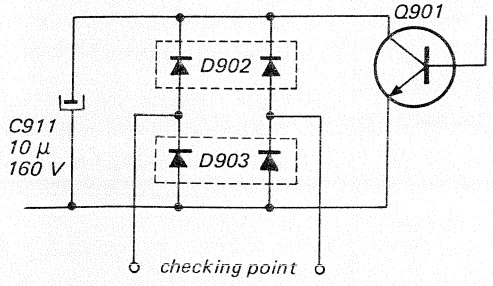
MONITOR switch . . . . . TAPE

Specifications

<table><tr><th>tape speed</th><th>counter reading</th></tr><tr><td>19 cm/s (7-1/2 ips)</td><td>4000 ± 40 Hz (± 1 %)</td></tr><tr><td>9.5 cm/s (3-3/4 ips)</td><td>2000 ± 20 Hz (± 1 %)</td></tr><tr><td>4.8 cm/s (1-7/8 ips)</td><td>1000 ± 20 Hz (± 2 %)</td></tr></table></td><td>(1) Play back the beginning of SONY alignment tape SPC-47 in horizontal position.

(2) Adjust R901, R903 and R905 for the counter reading shown in the table below.

<table><tr><th>tape speed</th><th>allowable range</th><th>adjusting parts</th></tr><tr><td>19 cm/s (7-1/2 ips)</td><td>4000 Hz ± 5 Hz</td><td>R901 10 kΩ (B)</td></tr><tr><td>9.5 cm/s (3-3/4 ips)</td><td>2000 Hz ± 3 Hz</td><td>R903 20 kΩ (B)</td></tr><tr><td>4.8 cm/s (1-7/8 ips)</td><td>1000 Hz ± 2 Hz</td><td>R905 50 kΩ (B)</td></tr></table>
(3) Make sure that the specifications shown in left table is satisfied at the beginning and end of tape in forward and reverse mode, with the unit placed in both horizontal and vertical position.

Note: Take the reading of a frequency counter after more than 5 seconds since the semi-fixed resistor has been finished to turn.</td></tr>
<tr><td>3. Capstan Bearing Position Adjustment</td><td>Test Setup:
 

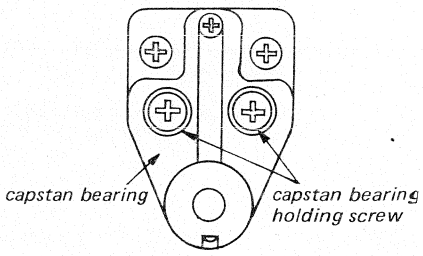
Specification:

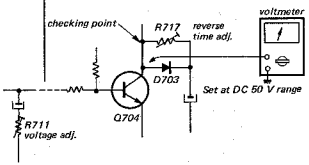
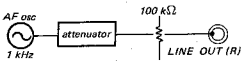
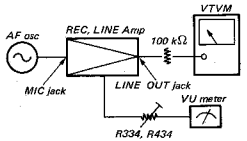
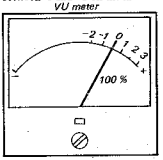
voltmeter reading . . . . . maximum</td><td>(1) Place the unit in the STOP mode.

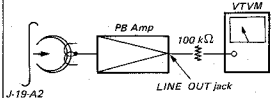
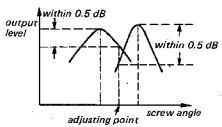
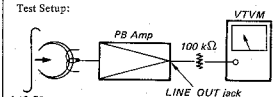
(2) Loosen the two capstan bearing holding screws.

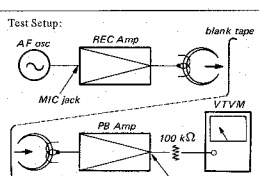
(3) Adjust the position of the capstan bearing so that the voltmeter reads a maximum.

(4) Tighten the screws and apply lock paint to the screws.

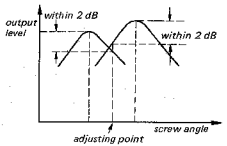
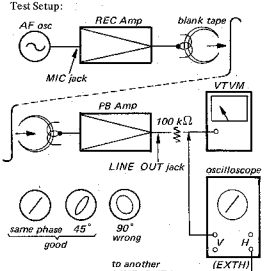
(See Fig. 3-1)
 
</td></tr>
</table>

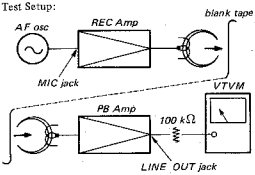
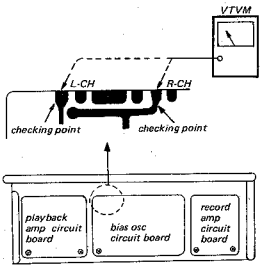
Items	Remarks	Procedures
4. ESP Adjustment	Test Setup: (1) Connect a voltmeter (20 kΩ/V) between checking point and ground.  (2) Deliver 1 kHz signal to R-CH LINE OUT jack.  Specification: Voltage at checking point ..... 10 ± 0.5 V Reverse time ..... 8 ± 2 sec	(1) Set the AUTO REV switch to CONT REV. (2) Deliver a 1 kHz of -43 dB (5.5 mV) to R-CH LINE OUT jack. (3) Place the unit in the forward mode. (4) Adjust R711 to obtain 10±0.5 V on the voltmeter. **Note:** Read after the indication of the voltmeter has been steady. (5) Thread a blank tape. (6) Change the input level from -43 dB (5.5 mV) to -33 dB (17 mV). (7) After passing more than 3 seconds since the level is changed, adjust R717 so that the tape transport direction will reverse at 6 10 seconds after changing to -63 dB (0.56 mV) from -33 dB (17 mV) again. (8) Repeat the above steps (2) through (7) so that the tape transport direction will be able to reverse surely in opposite direction. (9) With the AUTO REV switch set to REV position, repeat the above steps (6) and (7) and make sure that the tape transport direction of the unit reverses. (10) When changing the AUTO REV switch to NON REV, make sure that the tape transport direction of the unit does not reverse.
5. VU Meter Calibration	Test Setup:  Switch Setting: MONITOR switch ..... SOURCE Specification: 0 ± 0.5 on the VU meter scale when the line output is 0 dB (0.775 V).	(1) Deliver a 1 kHz signal of -60 dB (0.775 mV) to the MIC jack. (2) Place the unit in the stereo-record mode. (3) Adjust the MIC volume control for 0 dB (0.775 V) on the VTVM. (4) Adjust R334 and R434 so that the pointer of VU meter stays at 0 ± 0.5 VU on the meter. (5) When changing the frequency from 1 kHz to 100 Hz and 10 kHz, make sure that the VU meter reads between -1 and +1 on the meter. 

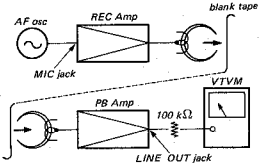
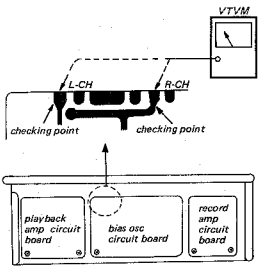
Items	Remarks	Procedures
6. Playback Head Azimuth and Angle Adjustment	Test Setup:  Switch Setting: MONITOR switch ..... TAPE Specification: Screw position where the maximum output is obtained. **Notes:** (1) Before the adjustment, make sure that the head comes in contact with the tape normally in forward mode.	(1) Play back the SONY alignment tape J-19-A2 (12.5 kHz). (2) Adjust the playback head azimuth adjusting screw for the maximum output on the VTVM. **Note:** If the maximum value for both channels can not be obtained at the same angle of the screw, take the mid between the two angles and make sure that the defference between the output obtained by turning the screw from the maximum output position and the each maximum output is within 0.5 dB. (3) Loosen the playback head angle adjusting screws. (4) Slightly, hold the supply reel table by the hand. (5) Adjust by moving the playback head in the direction shown by the arrows (See Fig. 3-26) so that the level fluctuation is the least at the maximum output and the playback output does not increase more than 0.5 dB. (6) Repeat the above steps (1) and (2). (7) Apply lock paint to the azimuth and angle adjusting screws. 
7. Playback Level Adjustment	Test Setup:  Switch Setting: MONITOR switch ..... TAPE Specification: 0 dB (0.775 V) ..... NORMAL −2.5∼−1.5 dB against NORMAL ..... SPECIAL **Note:** The adjustment should be performed for both L-CH and R-CH in forward and reverse modes.	(1) Set the TAPE SELECT switch to NORMAL. (2) Play back the 1st tone (400 Hz, 0 dB) of the SONY alignment tape J-19-F2. (3) Adjust R316, R317, R416 and R417 for 0 dB (0.775 V) on the VTVM. R316 (L-CH forward run) R416 (R-CH forward run) R317 (L-CH reverse run). R417 (R-CH reverse run) (4) When changing the TAPE SELECT switch to SPECIAL, make sure that the VTVM reads between −2.5 dB and −1.5 dB (0.58 V and 0.64 V).

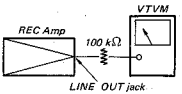
<table>
<tr><th>Items</th><th>Remarks</th><th>Procedures</th></tr>
<tr>
<td>8. Playback Equalizer Adjustment</td>
<td>
Test Setup:
Same as Item 7
Switch Setting:
MONITOR switch ..... TAPE
Specification:
Deviation against 400 Hz of 2nd tone
<table>
<tr><th colspan="7">at 19 cm/s tape speed with J-19-F2</th></tr>
<tr><td>tape tone</td><td></td><td>3rd</td><td>4th</td><td>5th</td><td>6th</td><td>7th</td></tr>
<tr><td>frequency</td><td></td><td>10 kHz</td><td>12.5 kHz</td><td>7 kHz</td><td>80 Hz</td><td>40 Hz</td></tr>
<tr><td>output level</td><td>L</td><td>± 2 dB</td><td>± 2 dB</td><td>± 2 dB</td><td>+ 3 dB</td><td>+ 5 dB</td></tr>
<tr><td></td><td>R</td><td></td><td></td><td></td><td>+ 1 dB</td><td>0 dB</td></tr>
</table>
Deviation against 400 Hz of 3rd tone
<table>
<tr><th colspan="6">at 9.5 cm/s tape speed with J-9-F1</th></tr>
<tr><td>tape tone</td><td></td><td>4th</td><td>5th</td><td>6th</td><td>7th</td></tr>
<tr><td>frequency</td><td></td><td>5 kHz</td><td>3 kHz</td><td>200 Hz</td><td>80 Hz</td></tr>
<tr><td>output level</td><td>L</td><td>± 2 dB</td><td>± 2 dB</td><td>± 2 dB</td><td>± 2 dB</td></tr>
<tr><td></td><td>R</td><td></td><td></td><td></td><td></td></tr>
</table>
Notes:
(1) First, 19cm/s (7-1/2 ips) equalizer adjustment should be performed.
(2) The adjustment should be performed for both L-CH and R-CH in forward and reverse modes.
(3) Level difference between the forward and reverse modes should be within 1 dB.
</td>
<td>
(1) Set the TAPE SPEED switch to 19cm/s (7-1/2 ips).
(2) Play back the 2nd (400 Hz) and 3rd (10 kHz) tones of SONY alignment tape J-19-F2.
(3) Adjust R319, R320, R419 and R420 so that the playback output of the 3rd tone is the same as that of the 2nd tone.
R319 (L-CH forward run)
R419 (R-CH forward run)
R320 (L-CH reverse run)
R420 (R-CH reverse run)
(4) Play back the 4th (12.5 kHz), 5th (7 kHz), 6th (80 Hz) and 7th (40 Hz) tones of SONY alignment tape J-19-F2 in order.
(5) Make sure that the each deviation against 400 Hz of 2nd tone is within specification shown in the left table.
(6) Set the TAPE SPEED switch to 9.5cm/s (3-3/4 ips).
(7) Play back the 3rd (400 Hz) and 4th (5 kHz) tones of SONY alignment tape J-9-F1.
(8) Adjust R321 and R421 so that the playback output of the 4th tone is the same as that of 3rd tone.
R321 (L-CH forward run)
R421 (R-CH forward run)
(9) Play back the 5th (3 kHz), 6th (200 Hz) and 7th (80 Hz) tones of SONY alignment tape J-9-F1 in order.
(10) Make sure that the each deviation against 3rd (400 Hz) tone is within ±2 dB as shown in the left table.
</td>
</tr>
<tr>
<td>9. Record Head Azimuth and Angle Adjustment</td>
<td>
Test Setup:


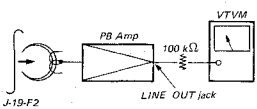
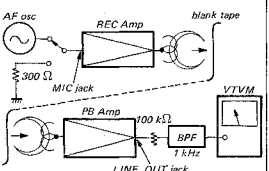
Control/Switch Setting:
*Record volume control
..... specified position on page 19
*MONITOR switch ..... TAPE
</td>
<td>
(1) Deliver a 15 kHz of −80 dB (77.5 μV) to the MIC jack.
(2) Place the unit in the forward (reverse) mode.
(3) Adjust the record head azimuth adjusting screw for the maximum output on the VTVM.
Note: If the screw is turned more than 1 turn, make the record head track adjustment again.
The maximum value for both channels can not be obtained at the same angle of the screw, take the mid between the two angles and make sure that the difference between the output obtained by turning the screw from the maximum output position and the each maximum output is within 2 dB.
</td>
</tr>
</table>

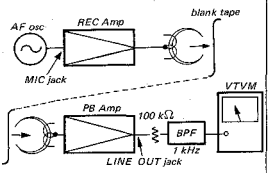
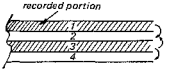
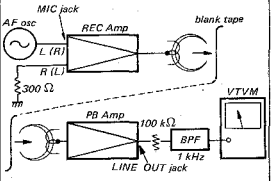
Items	Remarks	Procedures
Record Head Azimuth and Angle Adjustment	Specification: *Screw position where the maximum output is obtained.	(4) Slightly, hold the supply reel table by the hand. (5) Make sure that the playback output does not increase more than 3 dB. If not, adjust by moving the record head in the direction shown by the arrows (See Fig. 3-26) so that the level fluctuation is the least at the maximum output. (6) Apply lock paint to the azimuth and angle adjusting screws. 
10. Record Head Track Adjustment	Test Setup:  Control/Switch Setting: *Record volume control . . . . . specified position on page 19 *MONITOR switch . . . . . TAPE Specification: *Lissajous figure on scope . . . . . within 45° *Playback output . . . . . maximum **Notes:** (1) Before the adjustment, make sure that the height of head is normal against the tape in the forward mode.	(1) Thread a blank tape. (2) Place the unit in the record mode. (3) Deliver a 1 kHz signal of −60 dB (0.775 mV) to the MIC jack. (4) Adjust the record head azimuth adjusting screw so that the lissajous figure on the scope is within 45°. (5) Carefully noting how many turns the screw is turned, adjust the record head height adjusting screw for the maximum output on the VTVM. (6) Turn the record head zenith adjusting screw in the same direction by the same turns as noted in the above step (5). **Note:** If the maximum value for both channels can not be obtained at the same angle of the screw, take the mid between the two angles and then make sure that the level difference from the each maximum value is less than 1 dB. (7) Check the record head azimuth adjustment.

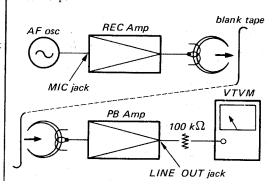
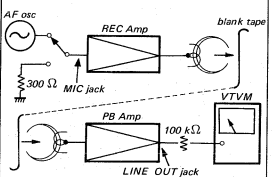
Items	Remarks	Procedures
Record Head Track Adjustment	(2) Perform this adjustment after that for the playback head was done.	
11. Dummy Coil Adjustment	Test Setup:  Control/Switch Setting: *Record volume control ..... Specified position on page 19 *MONITOR switch ..... TAPE	(1) Thread a blank tape. (2) Deliver a 20 kHz signal of −80 dB (77.5 μV) to the MIC jack. (3) Place the unit in the stereo-record mode. (4) Note the VTVM reading. (5) Place only L-CH in the record mode. (6) Adjust L504 slowly so that the VTVM reading is the same as the value obtained in the step 4. L504 (L-CH forward run) L503 (R-CH forward run) L506 (L-CH reverse run) L505 (R-CH reverse run)
12. Reverse Bias Frequency Adjustment	Test Setup:  Control Setting: Record volume control ..... fully counterclockwise Specification: Less than −10 dB **Note:** Perform after the trap coil adjustment.	(1) Place the unit in the reverse-stereo record mode. (2) Adjust C509 so that the VTVM reads a minimum (less than −10 dB). **Note:** If the minimum value for both channels can not be obtained at the same angle of the trimmer capacitor, take the mid between the two angles. After the adjustment, make sure that the VTVM reads less than −10 dB. (3) Apply lock paint to the trimmer capacitor.

Items	Remarks	Procedures
13. Record Bias Adjustment	Test Setup:  Control/Switch Setting: *Record volume control . . . . . specified position on page 19 *MONITOR switch . . . . . TAPE Specification: *0 +1 dB . . . . at peak bias point *0 ± 2 dB . . . . playback output of 18 kHz signal against that of 1 kHz signal **Note:** The adjustment should be performed for both L-CH and R-CH in forward and reverse modes.	(1) Turn C510, C511, C512 and C513 clockwise to the full and return them approximately three times. (2) Thread a blank tape. (3) Deliver a 1 kHz signal of −80 dB (77.5 μV) to the MIC jack. (4) Place the unit in the stereo-record mode. (5) Slowly, turn C510, C511, C512 and C513 clockwise, and the VTVM reading will go up and reach a maximum. So note the VTVM reading. C510 (L-CH forward run) C511 (R-CH forward run) C512 (L-CH reverse run) C513 (R-CH reverse run) (6) Change the input signal frequency from 1 kHz to 18 kHz. (7) Turn C510, C511, C512 and C513 further clockwise so that the VTVM reading is the same as the value noted in the step (5). **Note:** Make sure that the VTVM reading does not fall more than 1 dB from the maximum output obtained in the step (5). (8) Apply lock paint to the trimmer capacitors.
14. Trap Coil and Bias Leakage Adjustment	Test Setup: A) Trap coil adjustment  	A) Trap Coil Adjustment (1) Set the record volume control (MIC and AUX) counterclockwise to the full. (2) Place the unit in the stereo-record mode. (3) Adjust L507 and L508 so that the VTVM connected netween the checking point and ground reads a minimum (less than -10 dB).

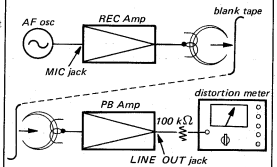
Items	Remarks	Procedures
Trap Coil and Bias Leakage Adjustment	B) Bias leakage adjustment  Specification: Less than -10 dB (Trap Coil Adjustment) Less than -35 dB (Bias Leakage Adjustment) **Notes:** (1) Use a non-metallic screwdriver. (2) Do not use shielded wire as the lead of the VTVM.	**B)** Bias Leakage Adjustment (1) Set the record volume control (MIC and AUX) clockwise to the full. (2) Place the unit in the stereo-record mode. (3) Set the MONITOR switch to TAPE. (4) Adjust L301 and L401 so that the VTVM reads a minimum (less than -35 dB). (5) Change the MONITOR switch to SOURCE and make sure that the VTVM reads less than -35 dB. L301 (L-CH forward run) L401 (R-CH forward run)
15. Record Level Adjustment	Test Setup: Same as Item 13 Control/Switch Setting: Record volume control ..... specified position on page 19 MONITOR switch ..... TAPE Specification: 0 ± 1 dB ..... Playback output at 19 cm/s (7-1/2 ips) tape speed 0 ± 2 dB ..... Playback output at 9.5 cm/s (3-3/4 ips) and 4.8 cm/s (1-7/8 ips) tape speed * The level difference between channels at 9.5 cm/s and 4.8 cm/s tape speed ..... within 2 dB * The level difference between stereo-record mode and monaural-record mode ..... within 1 dB **Note:** The adjustment should be performed for both L-CH and R-CH in forward and reverse modes.	(1) Deliver a 1 kHz signal of -60 dB (0.775 mV) to the MIC jack. (2) Set the TAPE SPEED switch to 19 cm/s (7-½ ips). (3) Place the unit in the stereo-record mode. (4) Adjust R127, R128, R227 and R228 so that the VTVM reads 0 dB (0.775 V). R127 (L-CH forward run) R227 (R-CH forward run) R128 (L-CH reverse run) R228 (R-CH reverse run) (5) When changing the TAPE SPEED switch to 9.5 cm/s (3-3/4 ips) and 4.8 cm/s (1-7/8 ips) make sure that the VTVM reads 0 ± 2 dB and that the difference between L-CH and R-CH is within 2 dB. (6) When changing a mode from stereo to monaural, make sure that difference between them is within 1 dB.

Items	Remarks	Procedures
16. Playback S/N Ratio Measurement	Test Setup:  Switch Setting: MONITOR switch . . . . . TAPE Specification: more than 48 dB in both FWD and REV modes	(1) Play back the 1st tone (400 Hz) of SONY alignment tape (J-19-F2). (2) Note the VTVM reading. (3) Remove the alignment tape. (4) Hold the both actuators so that the shut-off switch is activated (a rubber band or piece of masking tape will hold the actuator as though tape were threaded on the unit). (5) Place the unit in the FWD or REV mode without the tape threaded. (6) Note the VTVM reading. (7) Make sure that the level difference between step (2) and step (6) is more than 48 dB. (8) Reverse the power plug to the AC outlet and repeat the step (1) through the step (6). (9) Make sure that the level difference is also more than 48 dB.
17. Erase Ratio Measurement	Test Setup:  Control/Switch Setting: *Record volume control . . . . . specified position on page 19 *MONITOR switch . . . . . TAPE Specification: *Erase ratio . . . . . more than 60 dB *Level fluctuation width . . . . . within 5 dB	(1) Thread a blank tape. (2) Deliver a 1 kHz signal of -50 dB (2.45 mV) to the MIC jack. (3) Record the signal on the tape, noting where the reading begins for a later reference. (4) Disconnect the audio oscillator. (5) Rewind a half of the recorded tape. (6) Terminate the MIC jack with a 300 Ω resistor. (7) Erase the tape by recording with no input signal. (8) Rewind again to the beginning of the recording. (9) Place the unit in the playback mode. (10) Play back the tape, reading the VTVM, and make sure that the difference between the two parts is more than 60 dB, and that the level fluctuation width is within 5 dB. If not, check the tape path adjustment.

Items	Remarks	Procedures
18. Crosstalk Measurement (between tracks)	Test Setup:  Control/Switch Setting: *Record volume control ..... specified position on page 19 *MONITOR switch ..... TAPE Specification: more than 60 dB **Note:** Use a well-demagnetized tape or a new tape.	(1) Deliver a 1 kHz signal of -50 dB (2.45 mV) to the MIC jack. (2) Record the signal on the tape in the stereo record mode. (3) Note the VTVM reading. (4) Invert and reverse the reels. (5) Play back the tape. (6) Measure the VTVM reading at both L-CH and R-CH LINE OUTputs. (7) Make sure that the difference between the step (3) and the step (6) is more than 60 dB. 
19. Crosstalk Measurement (between channels)	Test Setup:  Control/Switch Setting: Same as Item 18 Specification: more than 45 dB **Note:** Use a well-demagnetized tape or a new tape.	(1) Thread a blank tape. (2) Terminate the R-CH (L-CH) MIC jack with a 300 Ω resistor. (3) Deliver a 1 kHz signal of -50 dB (2.45 mV) to the L-CH (R-CH) MIC jack. (4) Place the unit in the stereo-record mode. (5) Make sure that the level difference between L-CH and R-CH is more than 45 dB.

Items	Remarks	Procedures
20. Overall Frequency Response Measurement	Test Setup:  Control/Switch Setting: *Recrod volume control ..... specified position on page 19 *MONITOR switch ..... TAPE *TAPE SELECT switch ..... SPECIAL (with a SONY SLH tape) ..... NORMAL (with a standard tape) Specification:	(1) Set the TAPE SPEED switch to 19 cm/s (7-1/2 ips). (2) Thread a blank tape. (3) Deliver a 1 kHz signal of -80 dB (77.5 μV) to the MIC jack. (4) Place the unit in the record mode. (5) Note the VTVM reading. (6) Change the frequecny of an audio oscillator to 50 Hz, 100 Hz, 5 kHz, 7 kHz, 10 kHz, 12.5 kHz and 18 kHz in order and note the VTVM reading. (7) Make sure that the level deviation of each frequency against 1 kHz signal is within the range specified. (8) Repeat the above steps (3) through (7) at the tape speed of 9.5 cm/s (3 3/4 ips) and 4.8 cm/s (1 7/8 ips).
21. Overall S/N Ratio Measurement	Test Setup:  Control/Switch Setting: *Record volume control ..... specified position on page 19 *MONITOR switch ..... TAPE	(1) Thread a blank tape. (2) Deliver a 1 kHz signal of −60 dB (0.775 mV) to the MIC jack. (3) Place the unit in the record mode. (4) Record the signal on the tape, noting where the recording begins for a later reference. (5) Disconnect the audio oscillator. (6) Rewind a half of the recorded tape. (7) Terminate the MIC jack with a 300 Ω resistor. (8) Place the unit in the record mode with no input signal. (9) Make sure that the difference between two parts is within the specification.

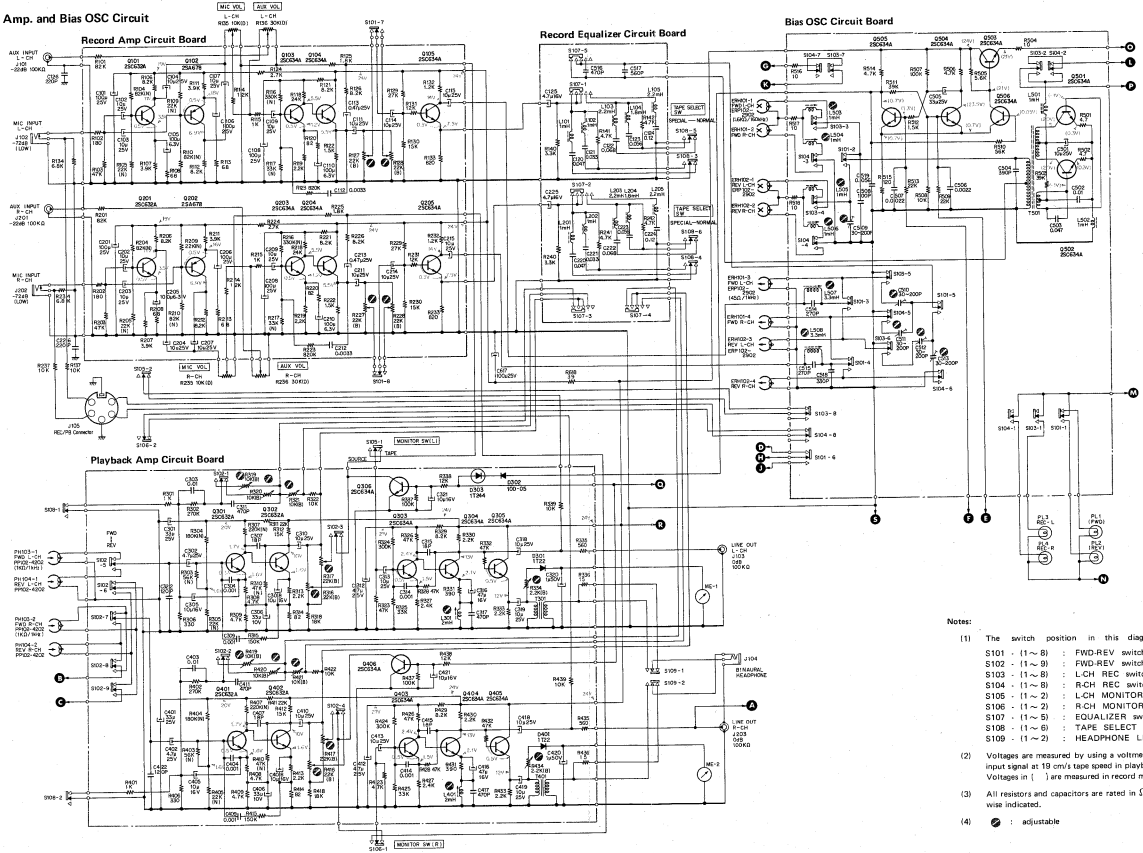
speed / freq.	19 cm/s	9.5 cm/s	4.8 cm/s
50 Hz	± 3 dB	$^{+3}_{-6}$ dB	$^{+3}_{-8}$ dB
100 Hz	± 3 dB	± 3 dB	± 3 dB
5 kHz	± 3 dB	± 3 dB	$^{+3}_{-6}$ dB
7 kHz	± 3 dB	± 3 dB	–
10 kHz	–	$^{+3}_{-3}$ dB	–
12.5 kHz	± 3 dB	$^{+3}_{-10}$ dB	–
18 kHz	NORMAL $^{+3}_{-6}$ dB SPECIAL ± 3 dB	–	–

Items	Remarks	Procedures
Overall S/N Ratio Measurement	Specification: *more than 45 dB at 19 cm/s tape speed *more than 41 dB at both 9.5 cm/s and 4.8 cm/s tape speed.	
22. Overall Distortion Measurement	Test Setup:  Control/Switch Setting: *Record volume control ..... specified position on page 19 *MONITOR switch ..... TAPE Specification: less than 1 %	(1) Thread a blank tape. (2) Deliver a 1 kHz signal of −60 dB (0.775 mV) to the MIC jack. (3) Place the unit in the record mode. (4) Make sure that the distortion meter reads less than 1 %.

SECTION 4
DIAGRAMS

4-1. SCHEMATIC DIAGRAM

4-1-1. Audio Amp. and Bias OSC Circuit



Notes:

(1) The switch position in this diagram is as follows:

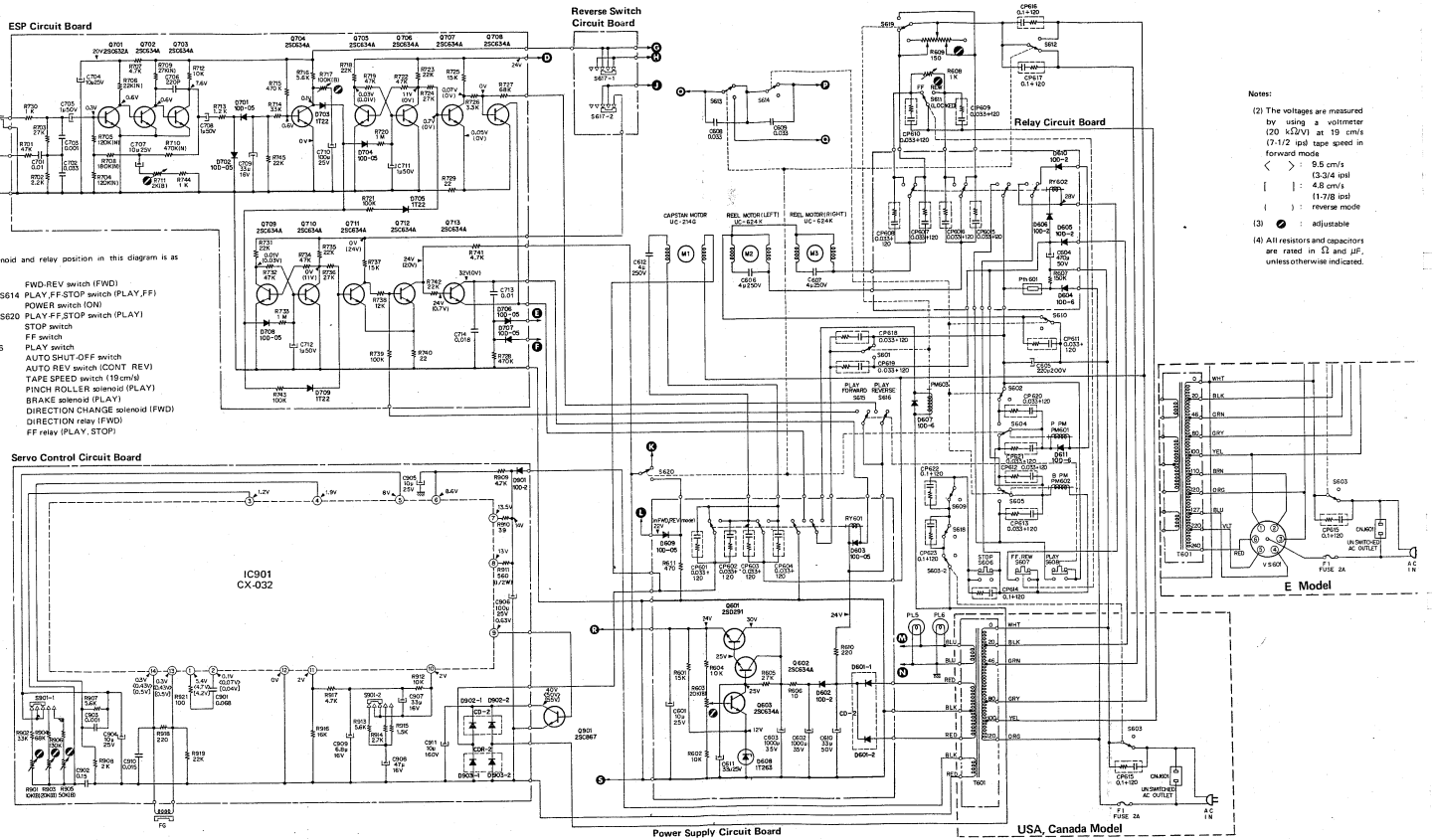
S101 - (1 ~ 8) : FWD-REV switch (1) (FWD)
S102 - (1 ~ 9) : FWD-REV switch (2) (FWD)
S103 - (1 ~ 8) : L-CH REC switch (OFF)
S104 - (1 ~ 8) : R-CH REC switch (OFF)
S105 - (1 ~ 2) : L-CH MONITOR switch (TAPE)
S106 - (1 ~ 2) : R-CH MONITOR switch (TAPE)
S107 - (1 ~ 5) : EQUALIZER switch (19 cm/s)
S108 - (1 ~ 6) : TAPE SELECT switch (NORMAL)
S109 - (1 ~ 2) : HEADPHONE LEVEL switch (LOW)

(2) Voltages are measured by using a voltmeter (20 kΩ/V) with no input signal at 19 cm/s tape speed in playback mode.
Voltages in ( ) are measured in record mode.

(3) All resistors and capacitors are rated in Ω and μF, unless otherwise indicated.

(4) ⊘ : adjustable

4-1-2. System Control Circuit



The switch, solenoid and relay position in this diagram is as follows:

S601, S619	FWD-REV switch (FWD)
S602,S605,S610,S614	PLAY,FF,STOP switch (PLAY,FF)
S603	POWER switch (ON)
S604,S612,S613,S620	PLAY-FF,STOP switch (PLAY)
S606	STOP switch
S607, S611	FF switch
S608, S615, S616	PLAY switch
S609, S618	AUTO SHUT-OFF switch
S617	AUTO REV switch (CONT. REV)
S901	TAPE SPEED switch (19 cm/s)
SOL601	PINCH ROLLER solenoid (PLAY)
PM602	BRAKE solenoid (PLAY)
PM603	DIRECTION CHANGE solenoid (FWD)
RY601	DIRECTION relay (FWD)
RY602	FF relay (PLAY, STOP)

Notes:

(2) The voltages are measured by using a voltmeter (20 kΩ/V) at 19 cm/s (7-1/2 ips) tape speed in forward mode

〈 〉 : 9.5 cm/s (3-3/4 ips)

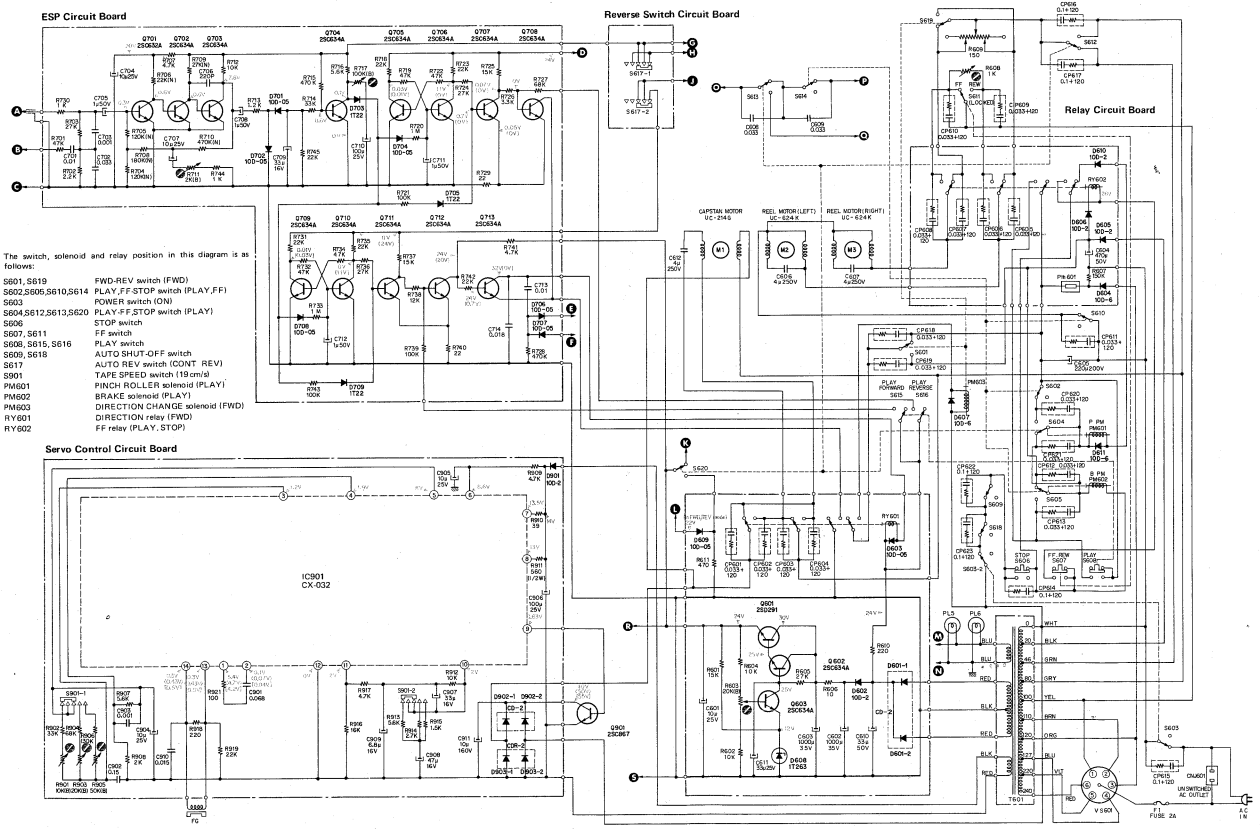
[ ] : 4.8 cm/s (1-7/8 ips)

( ) : reverse mode

(3) ⊘ : adjustable

(4) All resistors and capacitors are rated in Ω and μF, unless otherwise indicated.

4-1-2. System Control Circuit



Note:

(1) The switch, solenoid and relay position in this diagram is as follows:

S601, S619	FWD-REV switch (FWD)
S602,S605,S610,S614	PLAY,FF-STOP switch (PLAY,FF)
S603	POWER switch (ON)
S604,S612,S613,S620	PLAY-FF,STOP switch (PLAY)
S606	STOP switch
S607, S611	FF switch
S608, S615, S616	PLAY switch
S609, S618	AUTO SHUT-OFF switch
S617	AUTO REV switch (CONT REV)
S901	TAPE SPEED switch (19 cm/s)
PM601	PINCH ROLLER solenoid (PLAY)
PM602	BRAKE solenoid (PLAY)
PM603	DIRECTION CHANGE solenoid (FWD)
RY601	DIRECTION relay (FWD)
RY602	FF relay (PLAY, STOP)

Notes:

(2) The voltages are measured by using a voltmeter (20 kΩ/V) at 19 cm/s (7-1/2 ips) tape speed in forward mode

< > : 9.5 cm/s (3-3/4 ips)

[ ] : 4.8 cm/s (1-7/8 ips)

( ) : reverse mode

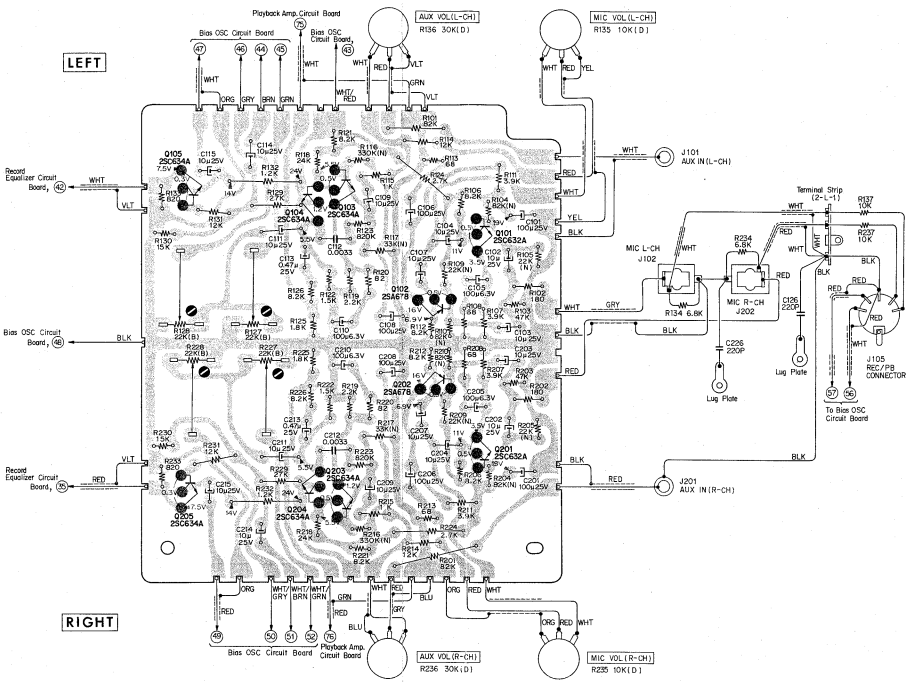
(3) ⊘ : adjustable

(4) All resistors and capacitors are rated in Ω and μF, unless otherwise indicated.

4-2. MOUNTING DIAGRAM

4-2-1. Record Amp. Circuit Board

– Conductor Side –

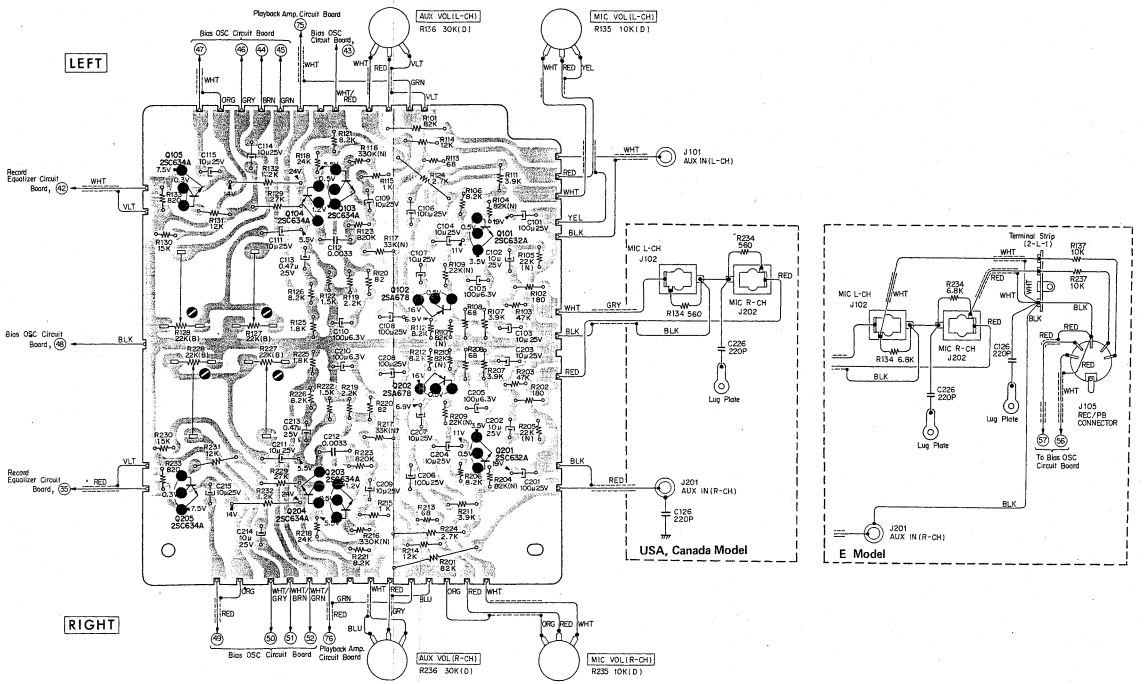


Printed Circuit Board
Part No. 1-581-040-11

4-2. MOUNTING DIAGRAM

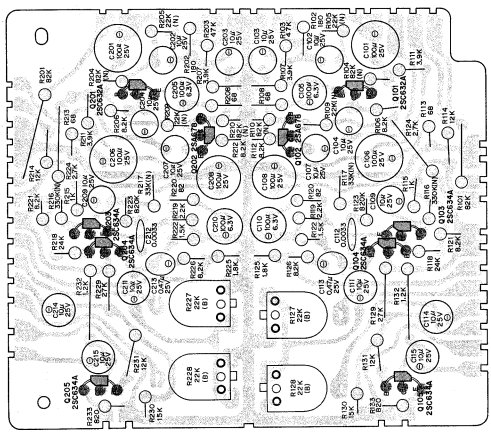
4-2-1. Record Amp. Circuit Board

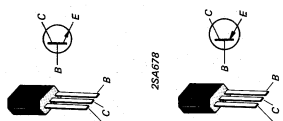
– Conductor Side –



Printed Circuit Board
Part No. 1-581-040-11

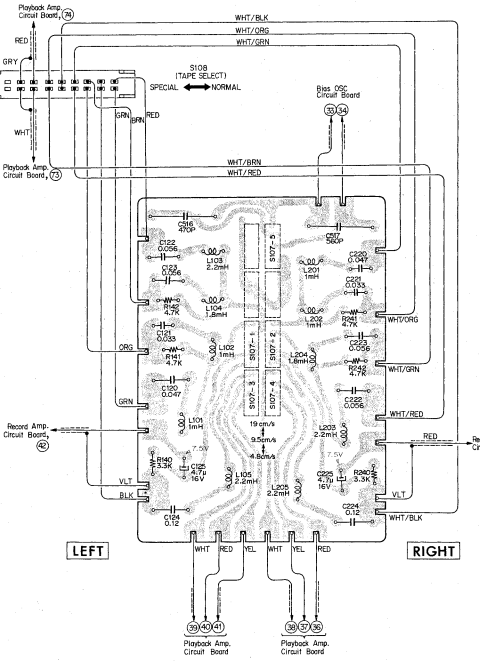
– Component Side –





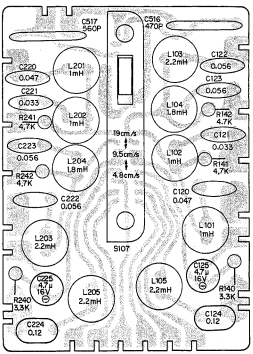
4-2-2. Record Equalizer Circuit Board

– Conductor Side –



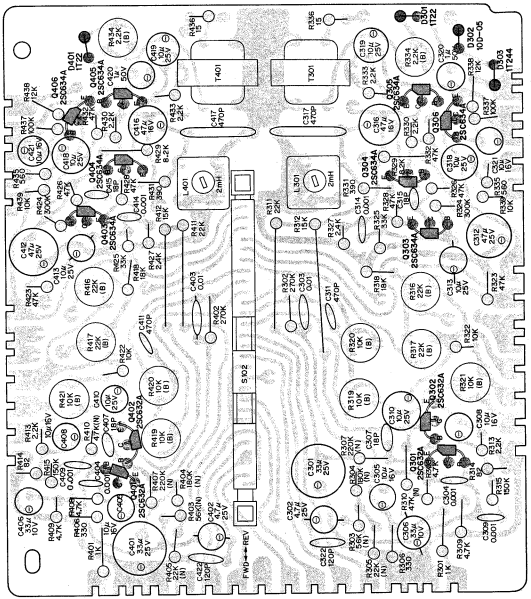
Printed Circuit Board
Part No. 1-581-041-11

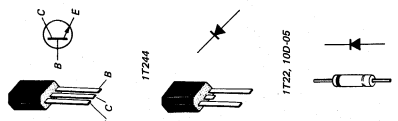
– Component Side –



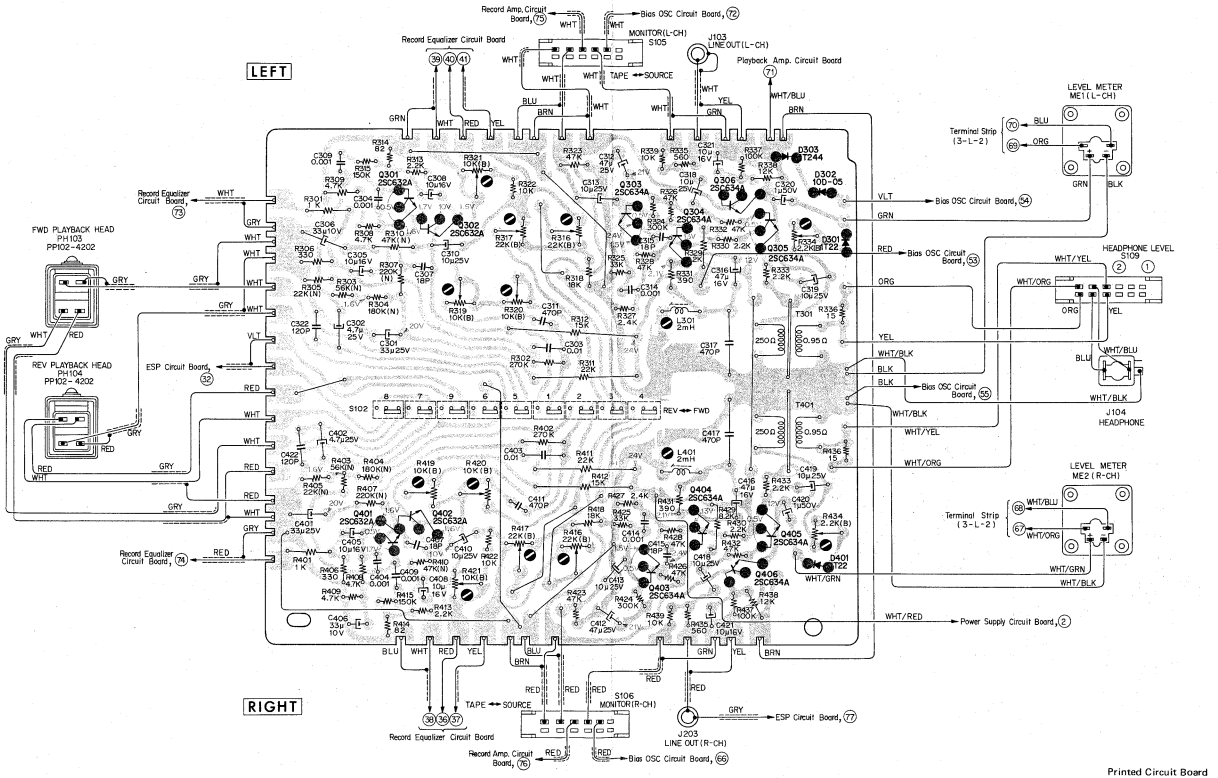
4-2-3. Playback Amp. Circuit Board

– Component Side –





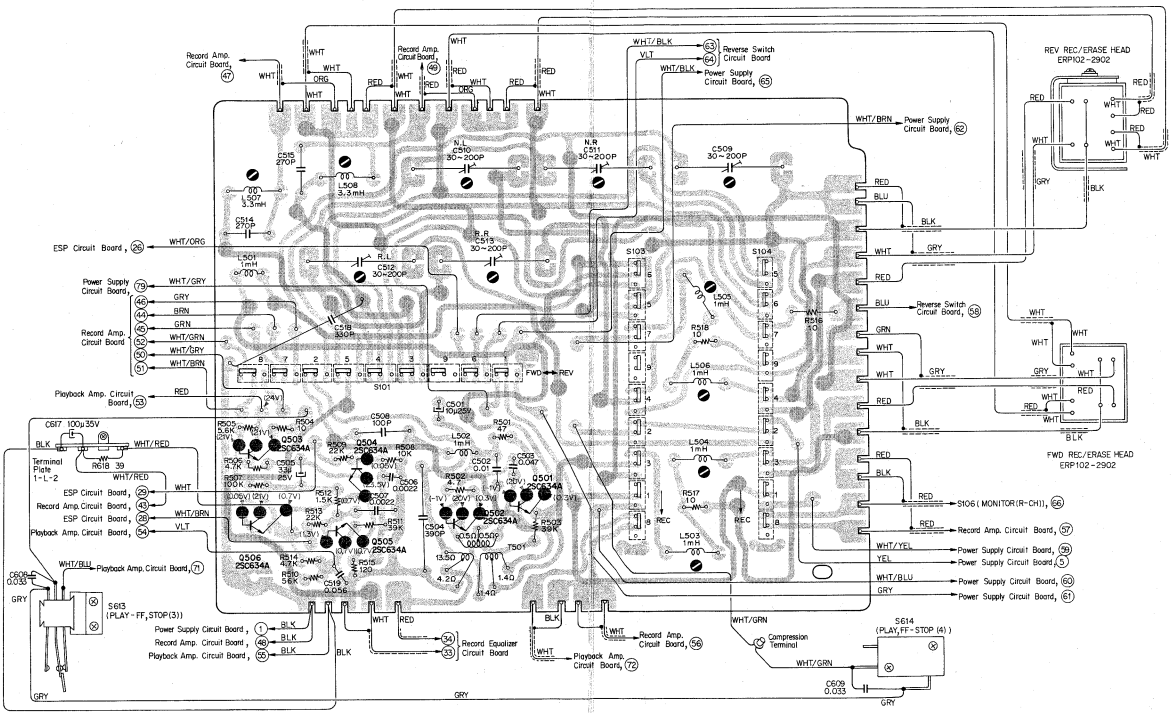
– Conductor Side –



Printed Circuit Board
Part No. 1-581-038-11

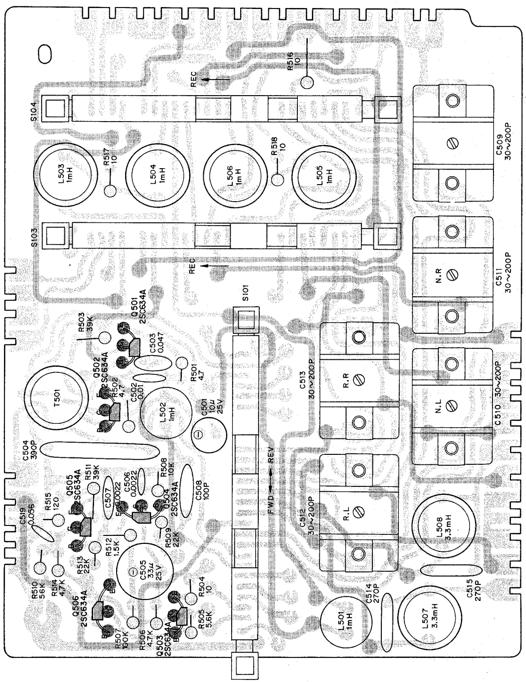
4-2-4. Bias OSC Circuit Board

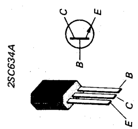
– Conductor Side –



Printed Circuit Board
Part No. 1-581-039-11

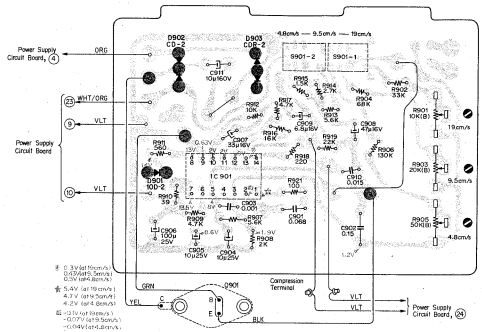
— Component Side —





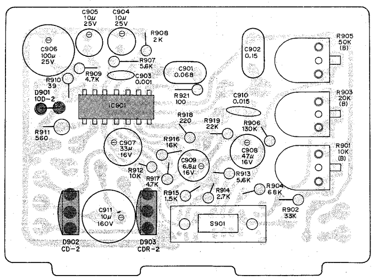
4-2-5. Servo Control Circuit Board

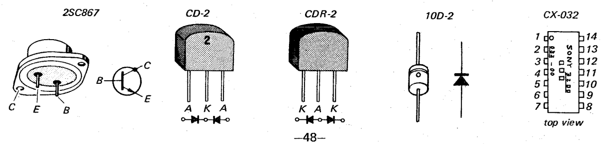
— Conductor Side —



Printed Circuit Board Part No. 1-581-005-12

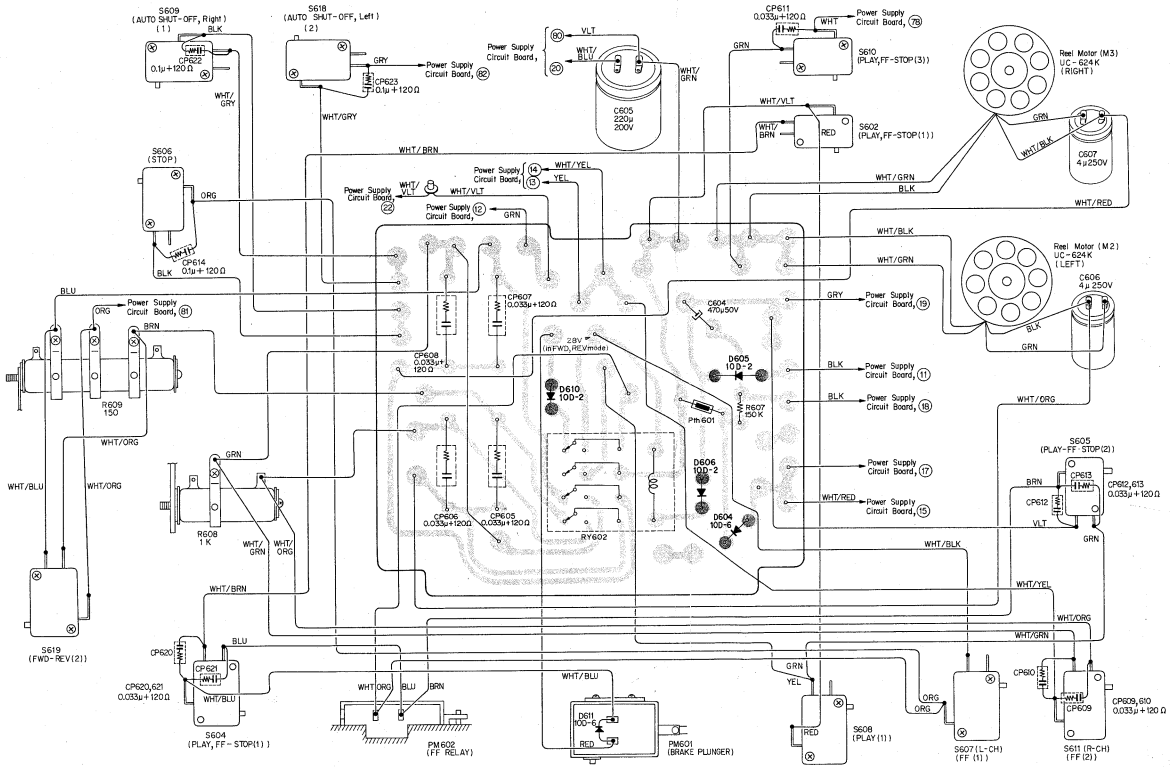
— Component Side —





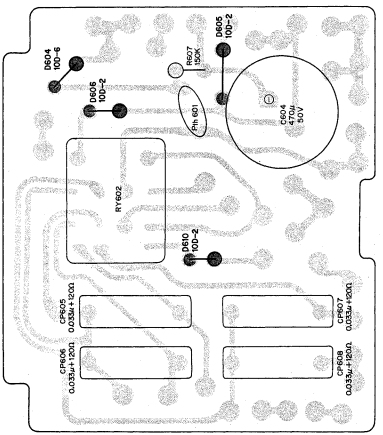
4-2-6. Relay Circuit Board

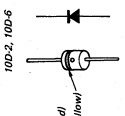
– Conductor Side –



Printed Circuit Board
Part No. 1-581-044-12

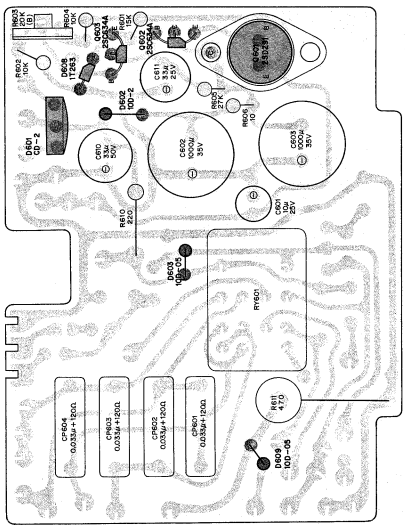
– Component Side –

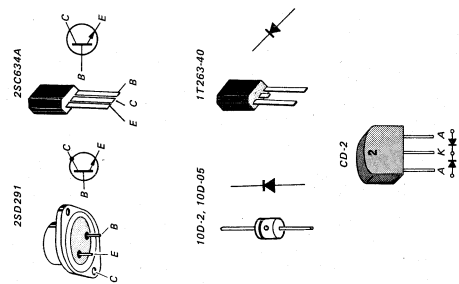




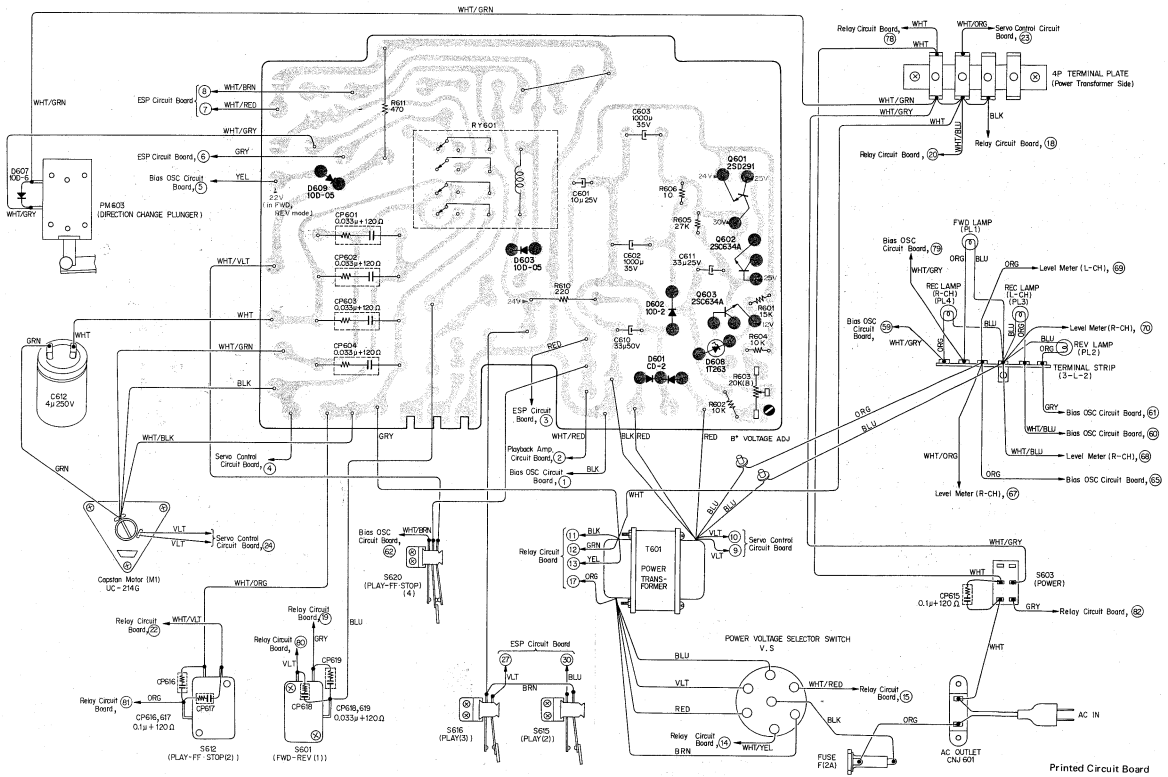
4-2-7. Power Supply Circuit Board

– Component Side –





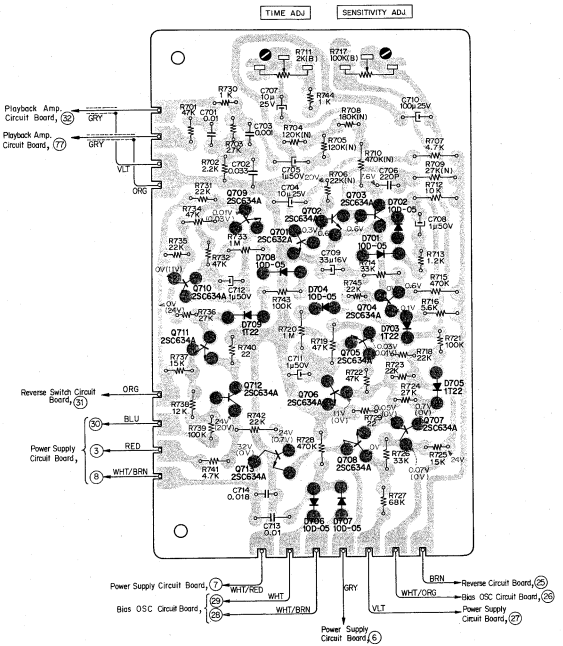
– Conductor Side –



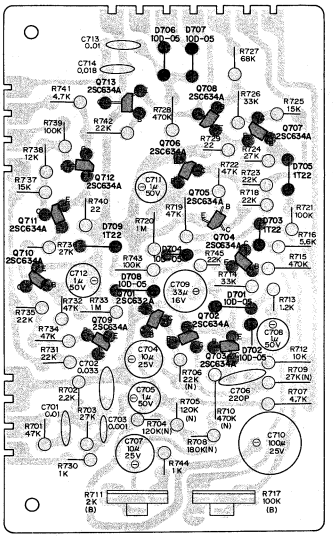
Printed Circuit Board
Part No. 1-581-043-12

4-2-8. ESP Circuit Board

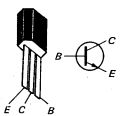
– Conductor Side –



– Component Side –



2SC632A, 2SC634A



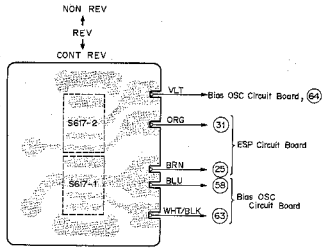
1T22

10D-05

Printed Circuit Board
Part No. 1-581-042-11

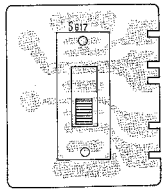
4-2-9. Reverse Switch Circuit Board

– Conductor Side –



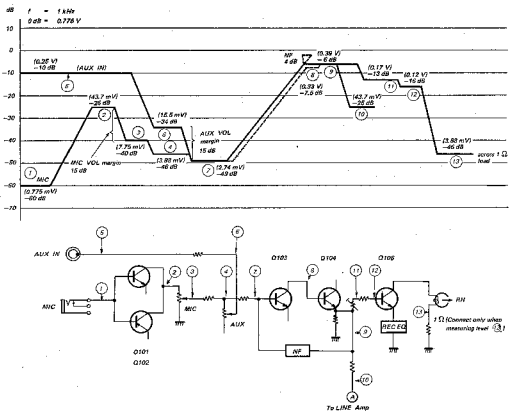
Printed Circuit Board
Part No. 1-581-045-11

– Component Side –

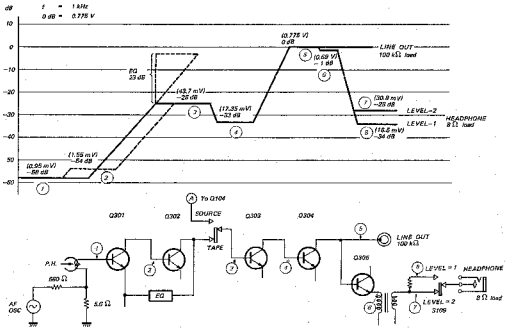


4-3. LEVEL DIAGRAM

Playback



Record



SECTION 5
ELECTRICAL PARTS LIST

MOUNTED CIRCUIT BOARDS

Ref. No.	Part No.	Description
	X-34970-61	record amp
	X-34970-62	record equalizer
	X-34970-63	playback amp
	X-34970-64	bias osc
	X-34970-65	power supply
	X-34970-66	relay
	X-34970-67	ESP
	X-34970-68	servo control
	X-34970-69	reverse switch

PRINTED CIRCUIT BOARDS

	1-581-005	servo control
	1-581-038	playback amp
	1-581-039	bias osc
	1-581-040	record amp
	1-581-041	record equalizer
	1-581-042	ESP
	1-581-043	power supply
	1-581-044	relay
	1-581-045	reverse switch

REC AMP CIRCUIT

SEMICONDUCTORS

Q101, 201	transistor,	2SC632A
Q102, 202	transistor,	2SA678
Q103, 203	transistor,	2SC634A
Q104, 204	transistor,	2SC634A
Q105, 205	transistor,	2SC634A

CAPACITORS

C101, 201	1-121-416	100 μF	25 V	electrolytic
C102, 202	1-121-398	10 μF	25 V	electrolytic
C103, 203	1-121-398	10 μF	25 V	electrolytic
C104, 204	1-121-398	10 μF	25 V	electrolytic
C105, 205	1-121-413	100 μF	6.3 V	electrolytic
C106, 206	1-121-416	100 μF	25 V	electrolytic
C107, 207	1-121-398	10 μF	25 V	electrolytic
C108, 208	1-121-416	100 μF	25 V	electrolytic
C109, 209	1-121-398	10 μF	25 V	electrolytic
C110, 210	1-121-413	100 μF	6.3 V	electrolytic
C111, 211	1-121-398	10 μF	25 V	electrolytic
C112, 212	1-105-667-12	0.0033μF	50 V	mylar
C113, 213	1-127-093	0.47 μF	25 V	electrolytic, alox
C114, 214	1-121-398	10 μF	25 V	electrolytic
C115, 215	1-121-398	10 μF	25 V	electrolytic

RESISTORS

All resistors are ¼ W and carbon type, unless otherwise indicated.

Ref. No.	Part No.		
R101, 201	1-242-719	82 kΩ	
R102, 202	1-242-655	180 Ω	
R103, 203	1-242-713	47 kΩ	
R104, 204	1-242-719-09	82 kΩ	low noise
R105, 205	1-242-705-09	22 kΩ	low noise
R106, 206	1-242-695	8.2 kΩ	
R107, 207	1-242-687	3.9 kΩ	
R108, 208	1-242-645	68 Ω	
R109, 209	1-242-705-09	22 kΩ	low noise
R110, 210	1-242-719-09	82 kΩ	low noise
R111, 211	1-242-687	3.9 kΩ	
R112, 212	1-242-695	8.2 kΩ	
R113, 213	1-242-645	68 Ω	
R114, 214	1-242-699	12 kΩ	
R115, 215	1-242-673	1 kΩ	
R116, 216	1-242-733-09	330 kΩ	low noise
R117, 217	1-242-709-09	33 kΩ	low noise
R118, 218	1-242-706	24 kΩ	
R119, 219	1-242-681	2.2 kΩ	
R120, 220	1-242-647	82 Ω	
R121, 221	1-242-695	8.2 kΩ	
R122, 222	1-242-677	1.5 kΩ	
R123, 223	1-242-743	820 kΩ	
R124, 224	1-242-683	2.7 kΩ	
R125, 225	1-242-679	1.8 kΩ	
R126, 226	1-242-695	8.2 kΩ	
R127, 227	1-222-775	22 kΩ (B)	semi-fixed
R128 228	1-222-775	22 kΩ (B)	semi-fixed
R129, 229	1-242-707-09	27 kΩ	low noise
R130, 230	1-242-701	15 kΩ	
R131, 231	1-242-699	12 kΩ	
R132, 232	1-242-675	1.2 kΩ	
R133, 233	1-242-671	820 Ω	
R134, 234	1-244-693	6.8 kΩ	

REC EQUALIZER CIRCUIT

MICROINDUCTORS

L101, 201	1-407-492	1 mH
L102, 202	1-407-492	1 mH
L103, 203	1-407-496	2.2 mH
L104, 204	1-407-495	1.8 mH
L105, 205	1-407-496	2.2 mH

Ref. No.	Part No.	Description

CAPACITORS

C120, 220	1-106-041-12	0.047 μF	50 V	mylar
C121, 221	1-106-037-12	0.033 μF	50 V	mylar
C122, 222	1-105-682-12	0.056 μF	50 V	mylar
C123, 223	1-105-682-12	0.056 μF	50 V	mylar
C124, 224	1-105-686-12	0.12 μF	50 V	mylar
C125, 225	1-121-395	4.7 μF	25 V	electrolytic

RESISTORS

R140, 240	1-242-685	3.3 kΩ	¼ W	carbon
R141, 241	1-242-689	4.7 kΩ	¼ W	carbon
R142, 242	1-242-689	4.7 kΩ	¼ W	carbon

SWITCH

S107	1-514-634	slide;	EQUALIZER

AMP CHASSIS CIRCUIT

CAPACITORS

C126, 226	1-107-139	220 pF	50 V	silvered mica

RESISTORS

R135, 235	1-222-498	10 kΩ (D)		variable, MIC
R136, 236	1-222-497	30 kΩ (B)		variable, AUX
R137, 237	1-244-697	10 kΩ	¼ W	carbon

JACKS

J101, 201	1-507-142	phono;	AUX IN
J102, 202	1-507-281		MIC
J103, 203	1-507-142	phono;	LINE OUT
J104	1-507-282	binaural;	HEADPHONE
J105	1-509-359	connector;	REC/PB

SWITCHES

S105	1-514-836	lever;	MONITOR
S106	1-514-836	lever;	MONITOR
S107		described in REC EQUALIZER CIRCUIT	
S108	1-514-867	lever;	TAPE SELECT
S109	1-514-768	lever;	HEADPHONE LEVEL

MISCELLANEOUS

PL3, 4	1-518-093-21	lamp, 2 V
ME1, 2	1-524-082-11	meter, VU

Ref. No.	Part No.	Description

HEAD DECK CIRCUIT

ERH101,102	8-828-629-20	head, record/erase (ERP102 - 2902)
PH103,104	8-829-142-20	head, playback (PP102 - 4202)
PL1, 2	1-518-093-21	lamp, 2 V

PLAYBACK AMP CIRCUIT

SEMICONDUCTORS

Q301, 401	transistor	2SC632A
Q302, 402	transistor	2SC632A
Q303, 403	transistor	2SC634A
Q304, 404	transistor	2SC634A
Q305, 405	transistor	2SC634A
Q306, 406	transistor	2SC634A
D301, 401	diode	1T-22
D302	diode	10D-05
D303	diode	1T244-47

COIL & TRANSFORMER

L301, 401	1-409-130	coil, trap; 2 mH
T301, 401	1-427-209	transformer, output

CAPACITORS

C301, 401	1-121-404	33 μF	25 V	electrolytic
C302, 402	1-121-395	4.7 μF	25 V	electrolytic
C303, 403	1-105-833-12	0.01 μF	50 V	mylar
C304, 404	1-105-821-12	0.001 μF	50 V	mylar
C305, 405	1-121-471	10 μF	16 V	electrolytic
C306, 406	1-121-402	33 μF	10 V	electrolytic
C307, 407	1-107-113	18 pF	50 V	silvered mica
C308, 408	1-121-471	10 μF	16 V	electrolytic
C309, 409	1-105-821-12	0.001 μF	50 V	mylar
C310, 410	1-121-398	10 μF	25 V	electrolytic
C311, 411	1-102-098	470 pF	50 V	ceramic
C312, 412	1-121-410	47 μF	25 V	electrolytic
C313, 413	1-121-398	10 μF	25 V	electrolytic
C314, 414	1-105-821-12	0.001 μF	50 V	mylar
C315, 415	1-107-113	18 pF	50 V	silvered mica
C316, 416	1-121-409	47 μF	16 V	electrolytic
C317, 417	1-107-244	470 pF	50 V	silvered mica
C318, 418	1-121-398	10 μF	25 V	electrolytic
C319, 419	1-121-398	10 μF	25 V	electrolytic
C320, 420	1-121-391	1 μF	50 V	electrolytic
C321, 421	1-121-471	10 μF	16 V	electrolytic
C322, 422	1-107-133	120 pF	50 V	silvered mica

Ref. No.	Part No.	Description	
		RESISTORS	
		All resistors are ¼ W and carbon type, unless otherwise indicated.	
R301, 401	1-242-673	1 kΩ	
R302, 402	1-242-731	270 kΩ	
R303, 403	1-242-715-09	56 kΩ	low noise
R304, 404	1-242-727-09	180 kΩ	low noise
R305, 405	1-242-705	22 kΩ	
R306, 406	1-242-661	330 Ω	
R307, 407	1-242-729-09	220 kΩ	low noise
R308, 408	1-242-689	4.7 kΩ	
R309, 409	1-242-689	4.7 kΩ	
R310, 410	1-242-713-09	47 kΩ	low noise
R311, 411	1-242-705	22 kΩ	
R312, 412	1-242-701	15 kΩ	
R313, 413	1-242-681	2.2 kΩ	
R314, 414	1-242-647	82 Ω	
R315, 415	1-242-725	150 kΩ	
R316, 416	1-221-979	22 kΩ (B)	semi-fixed
R317, 417	1-221-979	22 kΩ (B)	semi-fixed
R318, 418	1-242-703	18 kΩ	
R319, 419	1-222-701	10 kΩ (B)	semi-fixed
R320, 420	1-222-701	10 kΩ (B)	semi-fixed
R321, 421	1-222-701	10 kΩ (B)	semi-fixed
R322, 422	1-242-697	10 kΩ	
R323, 423	1-242-713	47 kΩ	
R324, 424	1-242-732	300 kΩ	
R325, 425	1-242-709	33 kΩ	
R326, 426	1-242-713	47 kΩ	
R327, 427	1-242-682	2.4 kΩ	
R328, 428	1-242-713	47 kΩ	
R329, 429	1-242-695	8.2 kΩ	
R330, 430	1-242-681	2.2 kΩ	
R331, 431	1-242-663	390 Ω	
R332, 432	1-242-713	47 kΩ	
R333, 433	1-242-681	2.2 kΩ	
R334, 434	1-221-997	2.2 kΩ (B)	semi-fixed
R335, 435	1-242-667	560 Ω	
R336, 436	1-242-629	15 Ω	
R337, 437	1-242-721	100 kΩ	
R338, 438	1-242-699	12 kΩ	
R339, 439	1-242-697	10 kΩ	
		SWITCH	
S102	1-514-813	slide ; DIRECTION	

Ref. No.	Part No.	Description	
		BIAS OSC CIRCUIT	
		SEMICONDUCTORS	
Q501~506		transistor 2SC634A	
		COILS & TRANSFORMER	
L501	1-407-195	microinductor, 1 mH	
L502	1-407-195	microinductor, 1 mH	
L503	1-407-284	variable inductor, 1 mH	
L504	1-407-284	variable inductor, 1 mH	
L505	1-407-284	variable inductor, 1 mH	
L506	1-407-284	variable inductor, 1 mH	
L507	1-407-239	variable inductor, 3.3 mH	
L508	1-407-239	variable inductor, 3.3 mH	
T501	1-433-140	transformer, bias osc	
		CAPACITORS	
C501	1-121-398	10 μF 25 V	electrolytic
C502	1-105-833-12	0.01 μF 50 V	mylar
C503	1-105-841-12	0.047 μF 50 V	mylar
C504	1-107-252	390 pF 1000 V	silvered mica
C505	1-121-404	33 μF 25 V	electrolytic
C506	1-105-825-12	0.0022 μF 50 V	mylar
C507	1-105-825-12	0.0022 μF 50 V	mylar
C508	1-107-144	100 pF 1000 V	silvered mica
C509	1-141-034	30~200 pF	trimmer
C510	1-141-034	30~200 pF	trimmer
C511	1-141-034	30~200 pF	trimmer
C512	1-141-034	30~200 pF	trimmer
C513	1-141-034	30~200 pF	trimmer
C514	1-107-018	270 pF 500 V	silvered mica
C515	1-107-018	270 pF 500 V	silvered mica
		RESISTORS	
		All resistors are ¼ W and carbon type, unless otherwise indicated.	
R501	1-242-617	4.7 Ω	
R502	1-242-617	4.7 Ω	
R503	1-242-711	39 kΩ	
R504	1-242-625	10 Ω	
R505	1-242-691	5.6 kΩ	
R506	1-242-689	4.7 kΩ	
R507	1-242-721	100 kΩ	
R508	1-242-697	10 kΩ	
R509	1-242-705	22 kΩ	
R510	1-242-715	56 kΩ	
R511	1-242-711	39 kΩ	
R512	1-242-677	1.5 kΩ	

Ref. No.	Part No.	Description
R513	1-242-705	22 kΩ
R514	1-242-689	4.7 kΩ
R515	1-242-651	120 Ω
R516	1-242-625	10 Ω
R517	1-242-625	10 Ω
R518	1-242-625	10 Ω

SWITCHES

S101	1-514-813	slide; DIRECTION
S102		discribed in PB AMP CIRCUIT
S103	1-514-813	slide; REC
S104	1-514-813	slide; REC

POWER SUPPLY CIRCUIT

SEMICONDUCTORS

Q601	transistor	2SD291
Q602	transistor	2SC634A
Q603	transistor	2SC634A
D601-1	diode	CD-2
D601-2	diode	CD-2
D602	diode	10D-2
D603	diode	10D-05
D608	diode	1T263-40
D609	diode	10D-05

CAPACITORS

C601	1-121-398	10 μF	25 V	electrolytic
C602	1-121-388	1000 μF	35 V	electrolytic
C603	1-121-388	1000 μF	35 V	electrolytic
C610	1-121-405	33 μF	50 V	electrolytic
C611	1-121-404	33 μF	25 V	electrolytic

RESISTORS

All resistors are ¼ W and carbon type, unless otherwise indicated.

R601	1-242-701	15 kΩ	
R602	1-242-697	10 kΩ	
R603	1-221-630	20 kΩ (B)	semi-fixed
R604	1-242-697	10 kΩ	
R605	1-242-707	27 kΩ	
R606	1-244-825	10 Ω	½W
R610	1-244-057	220 Ω	½W
R611	1-206-127	470 Ω	2 W wirewound

MISCELLANEOUS

CP601~604	1-231-057	encapsulated component C-R 0.033 μF + 120 Ω

Ref. No.	Part No.	Description
RY601	1-515-127	relay, DC24 V

RELAY CIRCUIT

SEMICONDUCTORS

D604	diode	10D-6
D605	diode	10D-2
D606	diode	10D-2
D610	diode	10D-2
Th601	thermistor	

CAPACITOR

C604	1-121-810	470 μF	50 V	electrolytic

RESISTOR

R607	1-242-725	150 kΩ	¼W	carbon

MISCELLANEOUS

CP605~608	1-231-057	encapsulated component C-R 0.033 μF + 120 Ω
RY602	1-515-127	relay, DC24 V

MECHANICAL CHASSIS CIRCUIT

SEMICONDUCTORS

D607, 611	diode	10D-6

TRANSFORMER

T601	1-441-729	power

CAPACITORS

C605	1-121-709	220 μF	200 V	electrolytic
C606	1-117-082	4 μF	250 V	metalized paper
C607	1-117-082	4 μF	250 V	metalized paper
C608	1-105-839-12	0.033 μF	50 V	mylar
C609	1-105-839-12	0.033 μF	50 V	mylar
C610		described in POWER SUPPLY CIRCUIT		
C611		described in POWER SUPPLY CIRCUIT		
C612	1-117-082	4 μF	250 V	metalized paper
C617	1-121-416	100 μF	25 V	electrolytic

RESISTORS

R608	1-227-092	1 kΩ	10 W	wirewound (semi-fiexd)

Ref. No.	Part No.	Description
R609	1-227-134	150 Ω 15 W wirewound (semi-fixed)
R618	1-242-639	39 Ω ¼W carbon

SWITCHES

S601	1-514-864	micro; FWD-REV (1)
S602	1-514-864	micro; PLAY, FF-STOP (1)
S603	1-514-866	lever; POWER
S604	1-514-864	micro; PLAY-FF, STOP (1)
S605	1-514-864	micro; PLAY, FF-STOP (2)
S606	1-514-865	micro; STOP
S607	1-514-865	micro; FF (1)
S608	1-514-865	micro; PLAY (1)
S609	1-514-864	micro; AUTO SHUT-OFF (1)
S610	1-514-864	micro; PLAY, FF-STOP (3)
S611	1-514-864	micro; FF (2)
S612	1-514-864	micro; PLAY-FF, STOP (2)
S613	1-514-706	leaf; PLAY-FF, STOP (3)
S614	1-514-864	micro; PLAY, FF-STOP (4)
S615	1-514-699	leaf; PLAY (2)
S616	1-514-699	leaf; PLAY (3)
S617	1-514-633	lever; CONT, REV/REV/REV OFF
S618	1-514-864	micro; AUTO SHUT-OFF (2)
S619	1-514-864	micro; FWD-REV (2)
S620	1-514-707	leaf; PLAY-FF, STOP (4)

MISCELLANEOUS

CP609~613	1-231-057	encapsulated component C-R 0.033 μF + 120 Ω
CP614~617	1-101-534	encapsulated component C-R 0.1 μF + 120 Ω
CP618~621	1-231-057	encapsulated component C-R 0.033 μF + 120 Ω
CP622, 623	1-101-534	encapsulated component C-R 0.1 μF + 120 Ω
PM601	1-454-075	plunger solenoid
PM602, 603	1-454-074	plunger solenoid
CNJ601	1-509-341	AC OUTLET
VS601	1-509-427	socket, power voltage selector
F1	1-532-100	fuse, 2A
	1-533-048	holder, fuse
	1-534-487	cord, power
	1-535-045	terminal, contact; printed circuit board
	1-535-046	receptacle
	1-536-029	terminal, 4P mold
	1-536-181	terminal strip 2L1
	1-536-183	terminal strip 2L3
M1	8-836-214-01	motor, capstan (UC-214G)
M2, 3	8-836-624-07	motor, reel (UC-624K)

ESP CIRCUIT

SEMICONDUCTORS

Q701	transistor	2SC632A
Q702~713	transistor	2SC634A
D701	diode	10D-05
D702	diode	10D-05
D703	diode	1T-22
D704	diode	10D-05
D705	diode	1T-22
D706	diode	10D-05
D707	diode	10D-05
D708	diode	10D-05
D709	diode	1T-22

CAPACITORS

C701	1-105-673-12	0.01 μF	50 V	mylar
C702	1-105-679-12	0.033 μF	50 V	mylar
C703	1-105-661-12	0.001 μF	50 V	mylar
C704	1-121-398	10 μF	25 V	electrolytic
C705	1-121-391	1 μF	50 V	electrolytic
C706	1-107-139	220 pF	50 V	silvered mica
C707	1-121-398	10 μF	25 V	electrolytic
C708	1-121-391	1 μF	50 V	electrolytic
C709	1-121-403	33 μF	16 V	electrolytic
C710	1-121-416	100 μF	25 V	electrolytic
C711	1-121-391	1 μF	50 V	electrolytic
C712	1-121-391	1 μF	50 V	electrolytic
C713	1-105-673-12	0.01 μF	50 V	mylar
C714	1-105-676-12	0.018 μF	50 V	mylar

RESISTORS

All resistors are ¼ W and carbon type, unless otherwise indicated.

R701	1-242-713	47 kΩ	
R702	1-242-681	2.2 kΩ	
R703	1-242-707	27 kΩ	
R704	1-242-723-09	120 kΩ	low noise
R705	1-242-723-09	120 kΩ	low noise
R706	1-242-705-09	22 kΩ	low noise
R707	1-242-689	4.7 kΩ	
R708	1-242-727-09	180 kΩ	low noise
R709	1-242-707-09	27 kΩ	low noise
R710	1-242-737-09	470 kΩ	low noise
R711	1-221-663	2 kΩ (B)	semi-fixed
R712	1-242-697	10 kΩ	
R713	1-242-675	1.2 kΩ	
R714	1-242-709	33 kΩ	
R715	1-242-737	470 kΩ	

Ref. No.	Part No.	Description
R716	1-242-691	5.6 kΩ
R717	1-221-664	100 kΩ (B) semi-fixed
R718	1-242-705	22 kΩ
R719	1-242-713	47 kΩ
R720	1-242-745	1 MΩ
R721	1-242-721	100 kΩ
R722	1-242-713	47 kΩ
R723	1-242-705	22 kΩ
R724	1-242-707	27 kΩ
R725	1-242-701	15 kΩ
R726	1-242-685	3.3 kΩ
R727	1-242-717	68 kΩ
R728	1-242-737	470 kΩ
R729	1-242-633	22 Ω
R730	1-242-673	1 kΩ
R731	1-242-705	22 kΩ
R732	1-242-713	47 kΩ
R733	1-242-745	1 MΩ
R734	1-242-713	47 kΩ
R735	1-242-705	22 kΩ
R736	1-242-707	27 kΩ
R737	1-242-701	15 kΩ
R738	1-242-699	12 kΩ
R739	1-242-721	100 kΩ
R740	1-242-633	22 Ω
R741	1-242-689	4.7 kΩ
R742	1-242-705	22 kΩ
R743	1-242-721	100 kΩ
R744	1-242-673	1 kΩ
R745	1-242-705	22 kΩ

SERVO CONTROL CIRCUIT

SEMICONDUCTORS

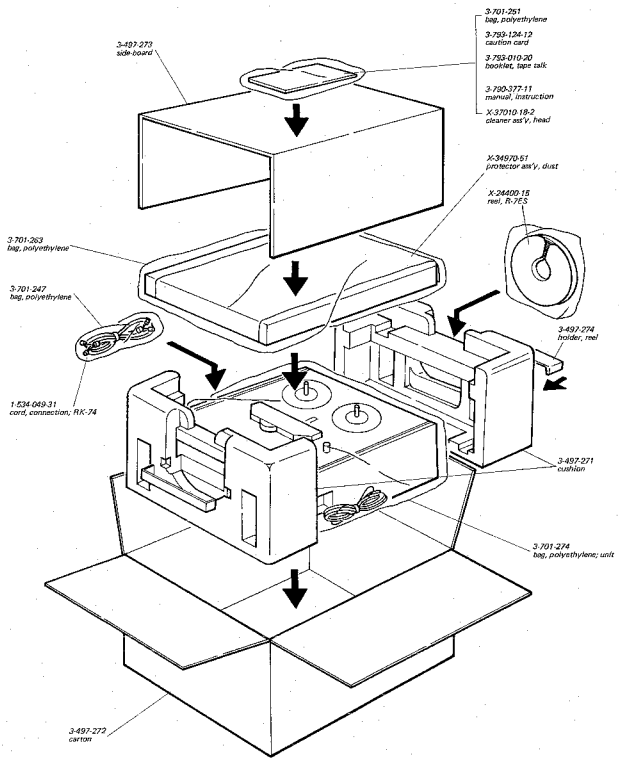
Q901	transistor	2SC867
D901	diode	10D-2
D902-1/2	diode	CD-2
D903-1/2	diode	CDR-2
IC901	integrated circuit	CX-032

Ref. No.	Part No.	Description
	CAPACITORS	
C901	1-105-843-12	0.068 μF 50 V mylar
C902	1-108-551-11	0.15 μF 50 V mylar
C903	1-105-821-12	0.001 μF 50 V mylar
C904	1-121-398	10 μF 25 V electrolytic
C905	1-121-398	10 μF 25 V electrolytic
C906	1-121-416	100 μF 25 V electrolytic
C907	1-121-403	33 μF 16 V electrolytic
C908	1-121-409	47 μF 16 V electrolytic
C909	1-127-306	6.8 μF 16 V electrolytic, alox
C910	1-105-835-12	0.015 μF 50 V mylar
C911	1-121-818	10 μF 160 V electrolytic
	RESISTORS	
		All resistors are ¼ W and carbon type, unless otherwise indicated.
R901	1-221-401	10 kΩ (B) semi-fixed
R902	1-242-709	33 kΩ
R903	1-221-952	20 kΩ (B) semi-fixed
R904	1-242-717	68 kΩ
R905	1-221-953	50 kΩ (B) semi-fixed
R906	1-242-724	130 kΩ
R907	1-242-691	5.6 kΩ
R908	1-242-680	2 kΩ
R909	1-242-689	4.7 kΩ
R910	1-242-639	39 Ω
R911	1-244-867	560 Ω ½ W
R912	1-242-697	10 kΩ
R913	1-242-691	5.6 kΩ
R914	1-242-683	2.7 kΩ
R915	1-242-677	1.5 kΩ
R916	1-242-702	16 kΩ
R917	1-242-689	4.7 kΩ
R918	1-242-657	220 Ω
R919	1-242-705	22 kΩ
	SWITCH	
S901	1-514-323	slide; TAPE SPEED

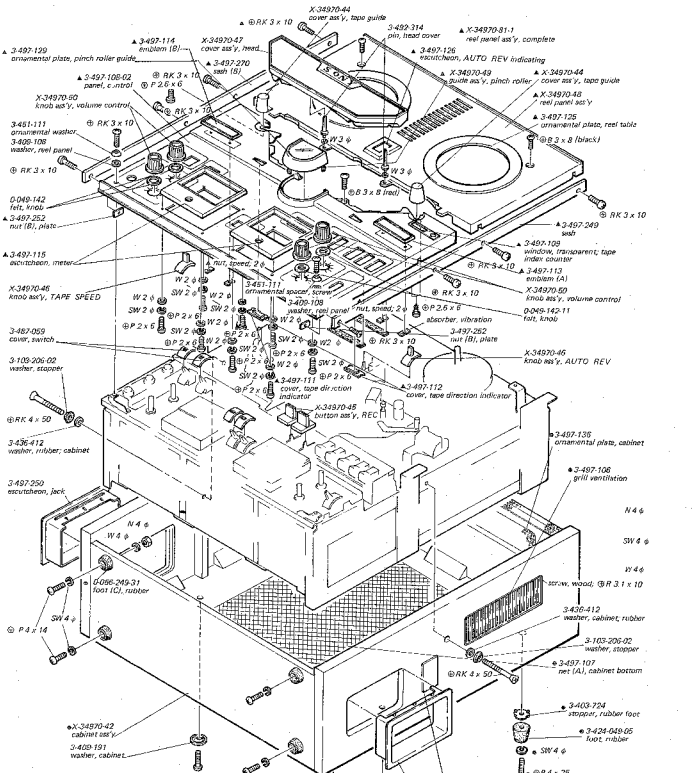
When ordering replacement parts you should use PART NUMBER listed on the Parts List or shown in the Exploded View. The reference number should not be used for ordering purposes.

SECTION 6
EXPLODED VIEWS

6-1. PACKING



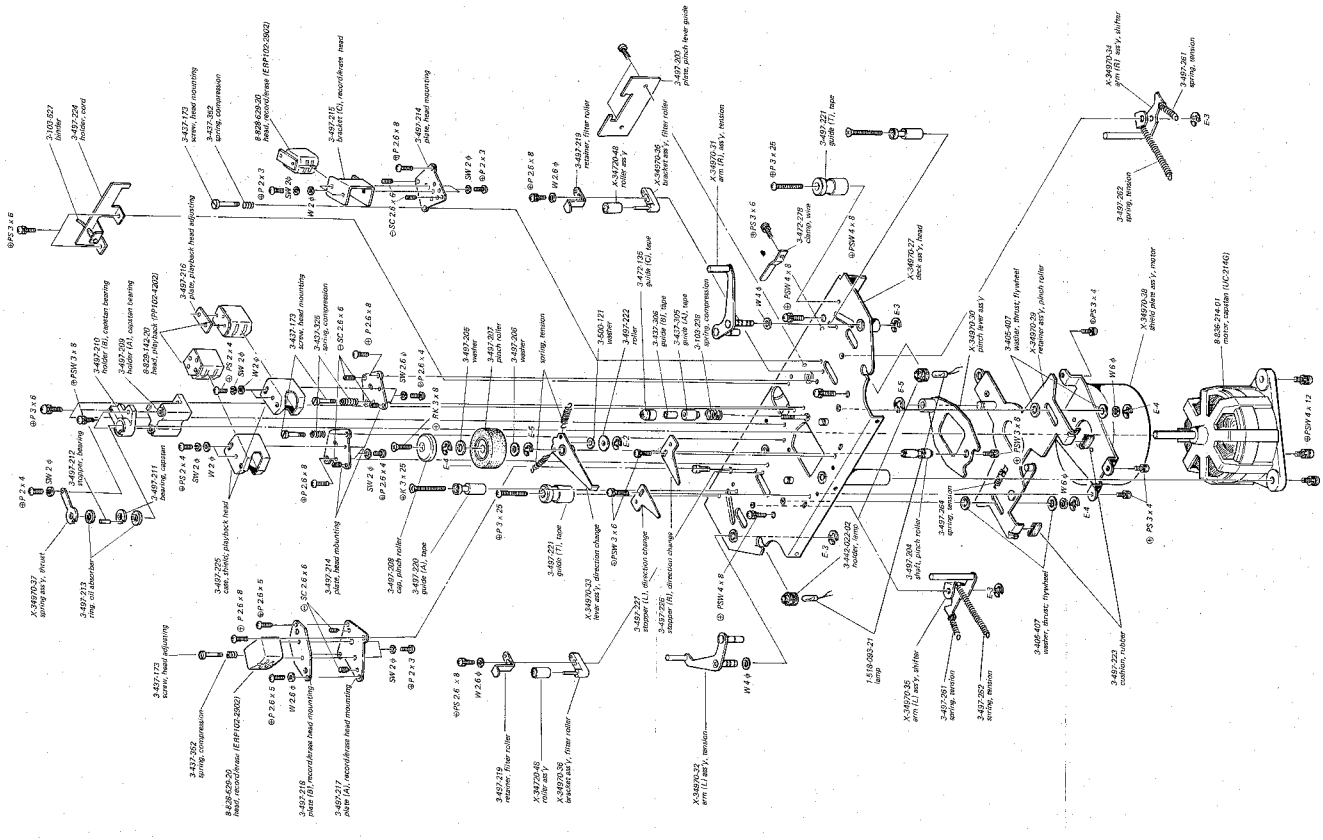
6-2. CABINET -- TOP VIEW --



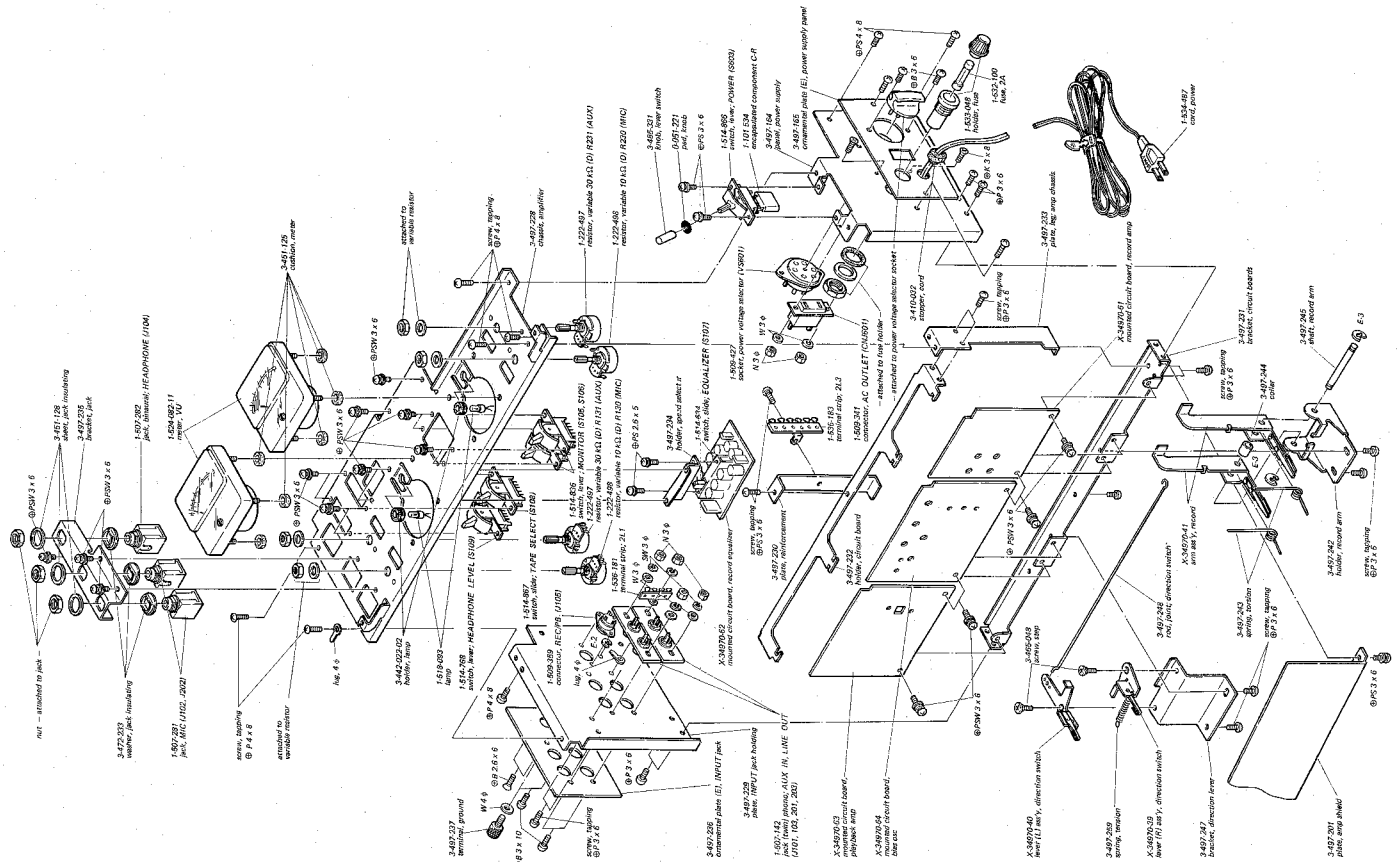
Parts marked with ▲ are included in reel panel ass'y, complete (No. X-34970-81-1).

Parts marked with ● are included in cabinet ass'y (No. X-34970-42).

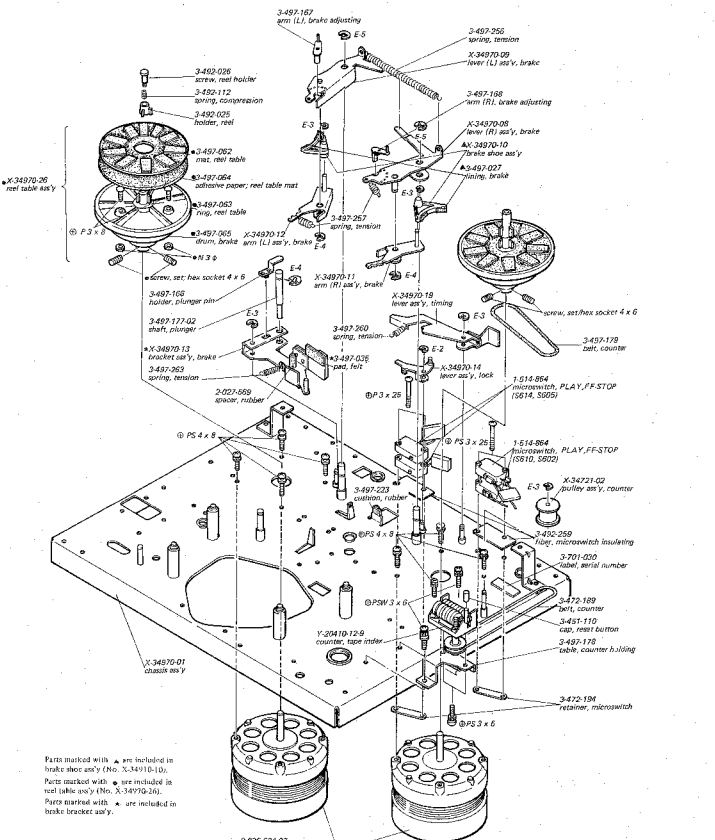
6-3. HEAD DECK – TOP VIEW –



6-4. AMPLIFIER CHASSIS – TOP VIEW –

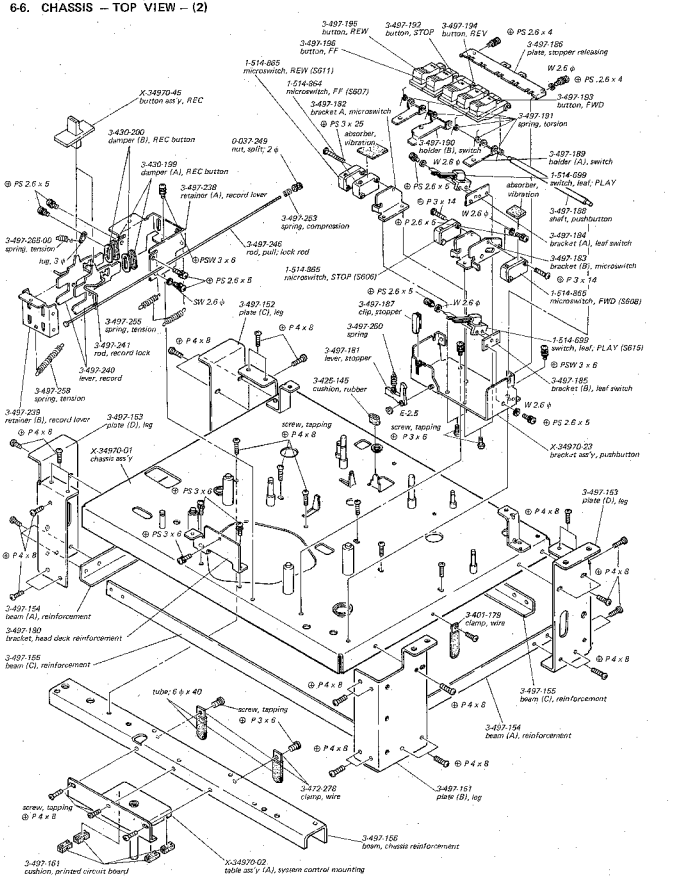


6-5. CHASSIS – TOP VIEW – (1)

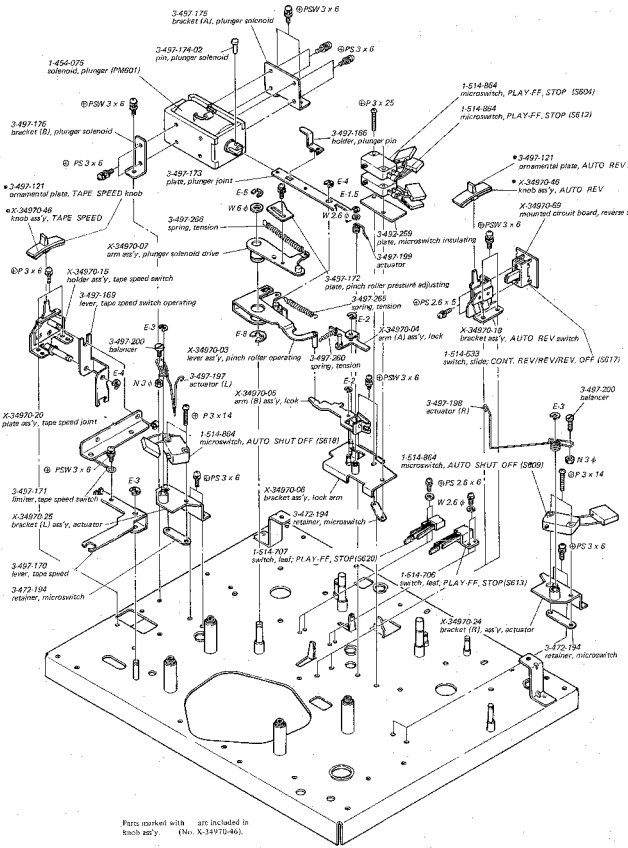


Parts marked with ▲ are included in brake shoe ass'y (No. X-34910-10).
Parts marked with ● are included in reel table ass'y (No. X-34970-26).
Parts marked with ★ are included in brake bracket ass'y.

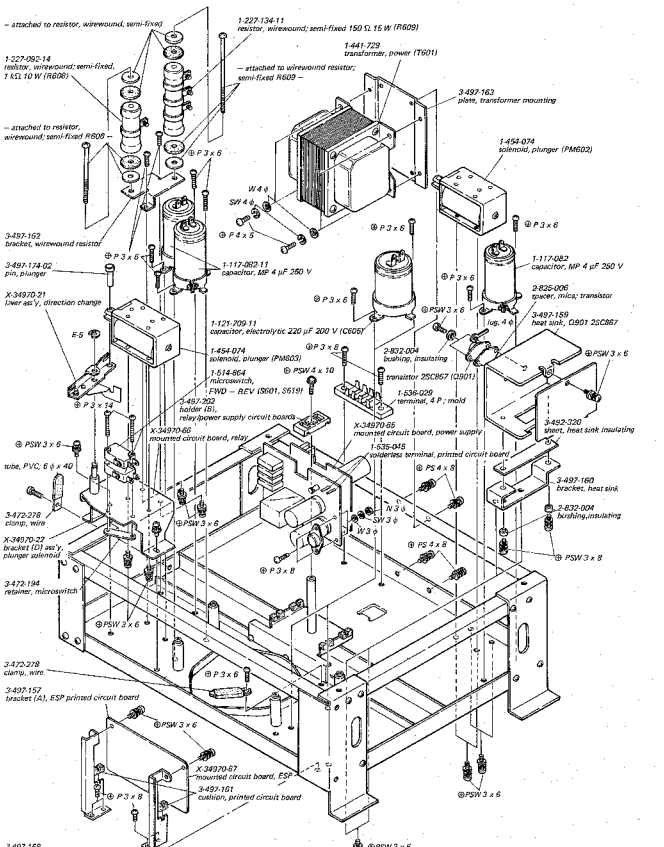
6-6. CHASSIS – TOP VIEW – (2)



6-7. CHASSIS – TOP VIEW – (3)



6-8. CHASSIS – BOTTOM VIEW –



TC-580

No. 1
OCT. 1971

SUPPLEMENT

SUBJECT : CIRCUIT DESCRIPTION

SONY®
SERVICE MANUAL

64

CIRCUIT DESCRIPTION

The following describes operation of main circuit:

1. RECORD AMP CIRCUIT

First stage of the record amplifier comprises NPN and PNP type transistors connected in parallel. This circuit improves linearity characteristics of record amplifier for MIC jack input signals. Approximately 50 dB linearity can be obtained. Therefore, can record signals with greater input level (approximately −10 dB, 0.25 V to MIC jack) with low distortion. Linearity for conventional circuit which has only one transistor is approximately 30 dB.

2. MUTING CIRCUIT

During direction change of tape transport (about three seconds), from the time when tape stops moving until tape motion reverses and recoveres to normal tape speed, B + voltage of bias oscillator is cut off in record mode and the muting circuits (Q306 and Q406) of playback amplifier are activated in playback mode.

When turning POWER switch ON, the multivibrator (Q504 and Q505) is kept stable as follows:

POWER switch is turned ON.

↓

Initial current through C505 turns Q505 ON.

↓

Decreased collector voltage of Q505 turns Q504 OFF.

↓

After C505 has been charged, Q505 base bias is applied through R507.

↓

Q505 is kept ON.

↓

Decreased collector voltage of Q505 keeps Q306 and Q406 OFF.	Decreased collector voltage of Q505 keeps Q506 OFF.
↓	↓
Playback amplifier normally works.	Q503 is kept ON and supplies B+ voltage to bias oscillator.

When changing the unit from FWD mode to REV mode or vice versa, this circuit acts as follows:

FWD → REV	REV → FWD
Negative trigger pulse through D707 turns Q505 OFF.	Positive trigger pulse through D706 turns Q504 ON.

↓

Increased collector voltage of Q505 turns Q504 ON.

↓

Collector voltage of Q504 decreases.

↓

Current flows through R506 and through R507 and C505.

↓

C505 discharges for about three seconds. During the discharge, Q505 is turned OFF by decreased base bias.

Increased collector voltage of Q505 turns Q306 and Q406 ON.	Increased collector voltage of Q505 turns Q506 ON.
↓	↓
Q306 and Q406 ground audio signals.	Q503 turns OFF and cut off B+ voltage to bias oscillator.

After the discharge, current stops flowing through R507 and C505.

Q505 is turned ON by increased base bias.

↓

Q504 is turned OFF.

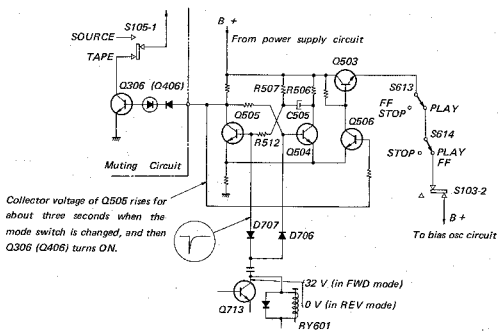


Fig. 1. Muting circuit

3. SYSTEM CONTROL

3-1. Tape transport direction changing operation

When REV pushbutton is pushed, S616 turns ON and then Q708 turns ON. Since Q713 is already kept activated, current flows through direction relay RY601 (REV relay) and RY601 is energized. Then contacts of RY601 short-circuit Q708. Therefore RY601 is kept energized in REV mode. Direction change solenoid PM603 is energized by contacts of RY601. Initial energizing voltage for RM603 is 170 volts dc and then the voltage is changed to 30 volts dc by S601 which RM603 actuates. When FWD pushbutton is pushed in REV playback mode, S615 turns ON. Q713 turns OFF and cuts current flow into RY601. Also tape transport direction can be changed by controlling voltage applied at point "a" and "b" in Fig. 2 from ESP circuit.

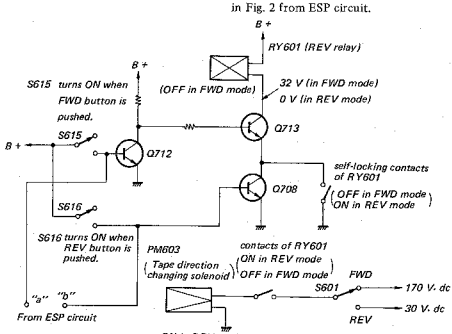


Fig. 2. System control circuit

3-2. Brake solenoid PM602

When FWD button is pushed, S608 turns ON. Then high voltage (about 170 volts dc) rectified by D604 is applied to PM602 through S605. PM602 is energized.

3-3. Reel motor circuit

The motor current flows as follows:

46 V or 80 V terminals of power transformer → S612 → R609 → contacts of relay RY602 → reel motors M2, M3 → S610 → 0 V terminal of power transformer

3-4. Pinch roller solenoid PM601

When S602 is turned ON by solenoid PM602, high voltage (about 170 volts dc) rectified by D604 is applied to PM601 through S604. PM601 is energized.

3-5. Solenoid operating voltage

Solenoids (for brake, pinch roller, and tape direction) are energized by high voltage (about 170 volts dc) and kept energized by low voltage (about 30 volts dc).

3-6. S612

This switch supplies a high reel-motor-driving voltage (80 volts ac) to make strong tape tension in a starting moment, because of tape slack elimination. When pressing FWD or REV button, S612 supplies 80 volts ac for about one second unitl pinch roller solenoid PM601 actuates S612. After solenoid PM601 has actuated S612, S613 supplies 46 volts ac for normal tape tension.

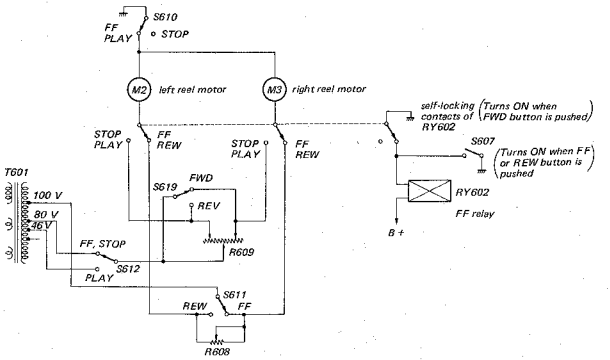


Fig. 3. Reel motor circuit

4. ESP (ELECTRIC SENSORY PERCEPTOR) CIRCUIT

Model TC-580 employs ESP circuit to reverse automatically tape travel direction in approximately eight seconds after signals from tape tracks 3 and 4 are over during playback operation. ESP circuit detects both signals from R-CH LINE OUT and R-CH head terminal of reverse track. If ESP circuit operates by signal only from LINE OUT, you may not enjoy a music from the beginning after ESP automatic reverse operation.

4-1. When no signal recorded part of tape beginning is played in forward playback mode:

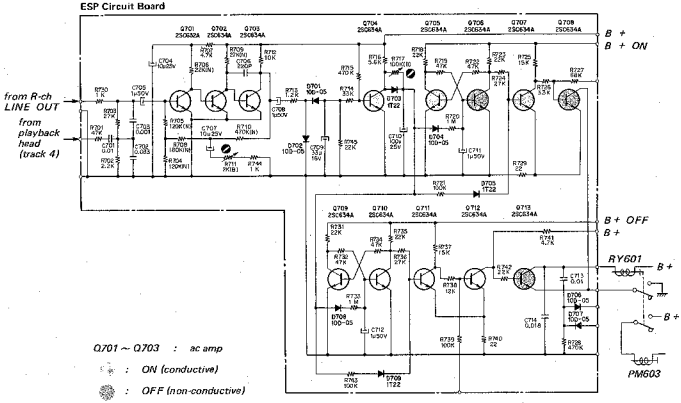


Fig. 4. ESP circuit (1)

RY601 DIRECTION relay : de-energized

PM603 DIRECTION CHANGE solenoid : de-energized

DC positive bias applied through R715 holds Q704 ON in no signal input.

4-2. When signal recorded part of tape is played in forward playback mode:

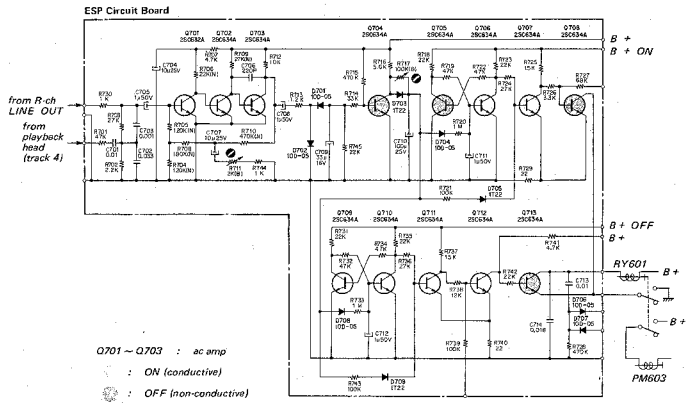


Fig. 5. ESP circuit (2)

RY601 DIRECTION relay: de-energized
PM603 DIRECTION CHANGE solenoid: de-energized

Input signal turns Q704 OFF. Q704 collector voltage turns Q706 ON and holds Q707 ON.

4-3. When signal recorded part of tape is over:

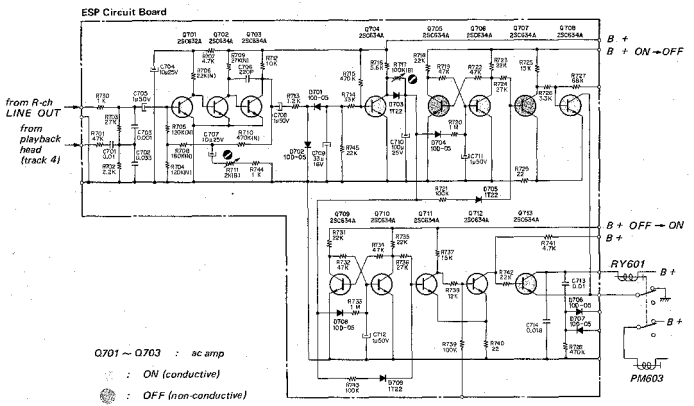


Fig. 6. ESP circuit (3)

RY601 DIRECTION relay: energized
PM603 DIRECTION CHANGE solenoid: energized

No-signal input turns Q704 ON. C710 discharges through R717 and Q704 for about six seconds. After that, Q707 turns OFF. The contacts of energized RY601 energize PM603 and cut off B + voltage for transistors Q705 through Q707. One of the RY601-contacts, however, turns Q713 ON and holds itself (RY601) energized.

4-4. After tape transport direction has been changed:

The contacts of energized RY601 cut off B + voltage for transistors Q705 through Q707, and supply B + voltage for transistors Q709 through Q711. In the reverse playback mode, Q709 through Q711 act in the same way as Q705 through Q707.

5. AC SERVO CIRCUIT

The Model TC-580 employs ac servo amplifier circuit and keeps tape speed constant.

5-1. Principle

See block diagram in Fig. 7. Motor speed determined by voltage Em can be changed by voltage Er.

$$E \text{ (fixed)} = Em + Er$$

When motor speed becomes faster or slower than intended speed according to external disturbances, the intended motor speed can be obtained again by changing voltage Er, or by changing resistance R. The frequency generator FG in the motor detects motor speed deviation. Servo amplifier changes resistance R according to the deviation. TC-580 uses impedance R between collector and emitter of transistor Q901 instead of resistance R as shown in Fig. 8. Impedance R can be changed by the base voltage. The motor speed can be kept stable by controlling the base voltage for the motor speed deviation. The bridge type rectifier comprising four diodes makes current flow through transistor Q901 in the direction shown by the arrow in Fig. 8.

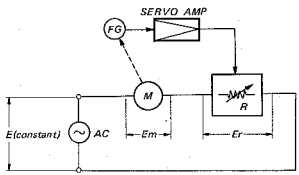


Fig. 7. Servo control system block diagram

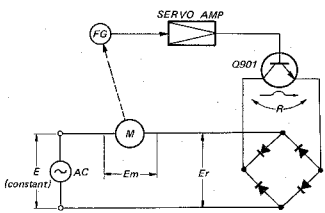


Fig. 8. Q901 instead of resistance R

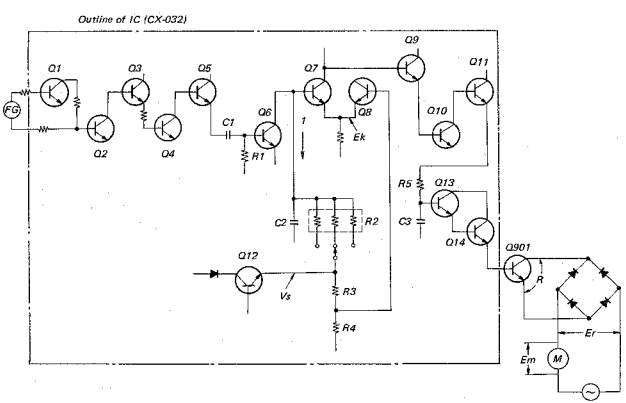


Fig. 9. Servo amplifier outline

5-2. Servo amplifier operation

Servo amplifier which changes impedance R operates as follows : See Fig. 9 and Fig. 10.

1) Sine wave signal generated by frequency generator FG is transfered to bases of Q1 and Q2. Since base bias voltages of Q1 and Q2 are set to saturation region, sine wave signal is waveshaped to square wave signal shown by (A) in Fig. 10.

2) Square wave signal from Q2 is amplified by Q3, Q4 and Q5. It is transfered to differentiating circuit comprising C1 and R1 and is waveshaped to pulse shown by (B) in Fig. 10. Then it is transfered to base of Q6.

3) Dc voltage Vs stabilized by Q12 is divided by R3 and R4. Then it is transfered to base of Q8 and keeps the emitter voltage Ek of Q8 (also that of Q7) constant.

4) Vs also charges C2 according to the time constant decided by C2 and R2. The charged voltage is applied to collector of Q6.
When pulse shown by (B) in Fig. 10 is transfered to base of Q6, Q6 repeats ON and OFF states. C2 discharges while Q6 makes current flow as shown by the arrow (1) in Fig. 9. Thus sawtooth wave signal shown by (C) in Fig. 10 is obtained at collector of Q6.

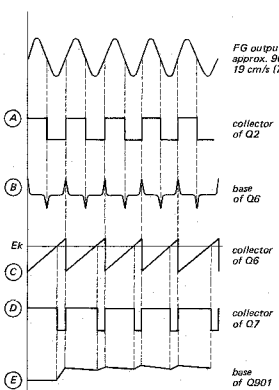


Fig. 10. Waveform at each point

5) The sawtooth wave signal is supplied to base of Q7. Since the emitter voltage Ek is kept constant, Q7 turns ON only when the peak value of sawtooth wave signal is greater than Ek. When Q7 turns ON, the negative pulse shown by (D) in Fig. 10, appears at collector of Q7.

6) This pulse is amplified by Q9, Q10 and Q11, and its polarity is inverted. The positive pulse is transfered to the integrator comprising R5 and C3, and is waveshaped as shown by (E) in Fig. 10. After being amplified by Q13 and Q14, it is transfered to base of Q901. And this base voltage changes impedance between collector and emitter of Q901 and controls motor speed.

5-3. Motor speed deviation from intended value

1) When motor speed becomes faster (Fig. 11);

Switching speed of Q6 becomes faster since frequency of frequency generator FG increases. Collector voltage of Q6 is grounded before it becomes greater than emitter voltage Ek (constant) because of short charging time for C2. The peak value of the sawtooth wave signal at base of Q7 is less than Ek. Thus Q7 turns OFF, and base voltage of Q901 decreases since the pulse is not supplied to base of Q9. When impedance R becomes greater, motor voltage Em decreases and motor speed decreases to the intended.

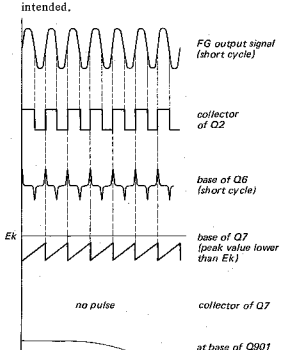


Fig. 11. When motor speed becomes faster

2) When motor speed becomes slower (Fig. 12);

Switching speed of Q6 becomes slower since frequency of frequency generator FG decreases. Collector voltage of Q6 is grounded after it becomes greater than emitter voltage of Q7 because of sufficient charging time for C2. The peak value of the sawtooth wave signal at base of Q7 is higher than Ek. Thus Q7 turns ON for T seconds, and base voltage of Q901 increases since the pulse is supplied to base of Q9, when impedance R becomes less, motor voltage Em increases and motor speed increases to the intended speed. Thus by changing the time T motor speed is controlled.
Time T is determined by charging-time of C2 (the inclination of the sawtooth wave). In this ac servo circuit, the time constant (C2 x R2) for charging time is determined by R2 for the specified tape speed.

3) Circuit operation when motor starts running;

Just after the power switch is turned ON, Q6 is still turned OFF since signal is not supplied from the frequency generator (motor is not running). C2 is charged rapidly, and greater voltage than Ek is applied to base of Q7. When base voltage of Q901 increases, ac voltage is applied to the motor and the motor starts running rapidly. In the FF mode, the servo circuit does not work and ac voltage is applied to the motor directly.
Then motor rotates at full speed.

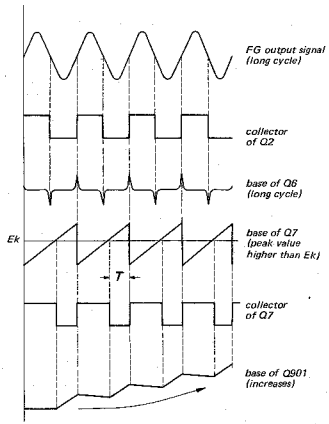
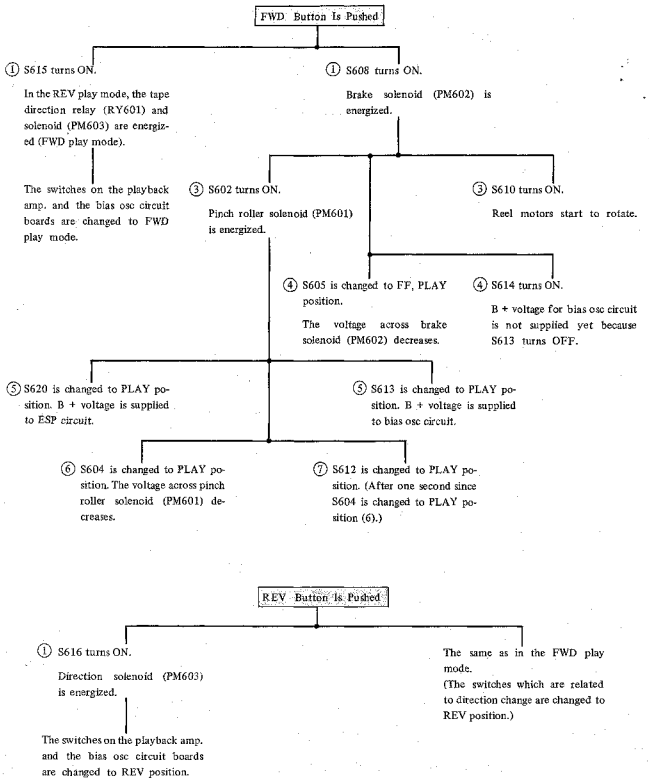


Fig. 12. When motor speed becomes slower

SEQUENCE OF SWITCH OPERATION

Note: The number in circle shows the sequence of switch operation when the mode is changed.



FF Button Is Pushed

- ① S611 is changed to FF position.
  - The motor circuit is changed to supply rated voltage to each reel motor.
- ① S607 turns ON.
  - FF relay (RY602) is energized (FF position)
    - ② Self-locking contact (1) of FF relay (RY602) is closed.
      - Pinch roller solenoid (PM601) circuit turns OFF.
    - ② Contact (2) of FF relay (RY602) is closed.
      - Brake solenoid (PM602) is energized.
        - ③ S602 turns ON.
          - As pinch roller solenoid (PM601) circuit is cut off by relay, this action is not related to FF operation.
        - ④ S605 is changed to FF position.
          - The voltage across brake solenoid (PM602) decreases.
        - These actions ④ are not related to FF operation.
    - ② Contacts (3) and (4) of FF relay (RY602) are closed.
      - AC rated voltage is applied to reel motors.
        - ③ S610 turns ON.
          - Reel motors start to rotate.
        - ④ S614 turns ON.

REW Button Is Pushed

- When S611 is set to the FF position, S611 is open.
- S607 turns ON.
  - FF relay (RY602) is energized (FF position).
  - The same as in the FF mode (The switches which are related to direction change are set to REW position.)

From FWD To REV Mode

The collector voltage of Q713 decreases from 32 V to 0 V.

Negative pulse is applied to the base of Q505. See Fig. 1.

Q505 turns OFF for approximately three seconds, and the collector voltage of Q505 rises.

Record Mode

- Q504 turns ON as its base voltage rises.
  - C505 discharges through R507
  - Q505 turns ON as its base voltage rises.
- Q506 turns ON as its base voltage rises.
  - Q503 turns OFF as its base voltage decreases. B + voltage for the bias osc circuit is cut off.

Playback Mode

- Q306 (Q406) turns ON as the base voltage of Q306 (Q406) rises.
  - The line output is grounded by Q306 (Q406).
  - After discharging of C505, Q505 turns ON again and Q306 (Q406) turns OFF.

SONY CORPORATION

1J0577-1

SONY®
SERVICE MANUAL

TC-580

General Export Model
USA Model

SUPPLEMENT

No. 2
NOVEMBER, 1971

SUBJECT: MINOR CHANGE OF FUNCTION SELECTOR MECHANISM
APPLICABLE SERIAL NO.: 13961 and later (General Export)
13001 and later (USA)

1. DESCRIPTION

Leaf switches S615 and S616 were changed and accordingly the function selector assembly was changed as per Fig. 1 on Page 2.

Parts Omitted:

Part No.	*Description*	
3-497-184-	bracket (A), leaf switch	
3-497-185-	bracket (B), leaf switch	
1-514-699-	switch, leaf (S615, S616)	2 pcs.

Parts Added:

Part No.	*Description*	
3-472-194-	retainer, microswitch	
3-497-287-	cushion, button	2 pcs.
1-514-423-	microswitch	2 pcs.

2. ADJUSTMENT

No adjustment is required. Therefore, 3-1-21 PLAY Switch (S615, S616) Position Adjustment on Page 16 of TC-580 SERVICE MANUAL is not required for the set having Serial No. 13001, 13961 and later.

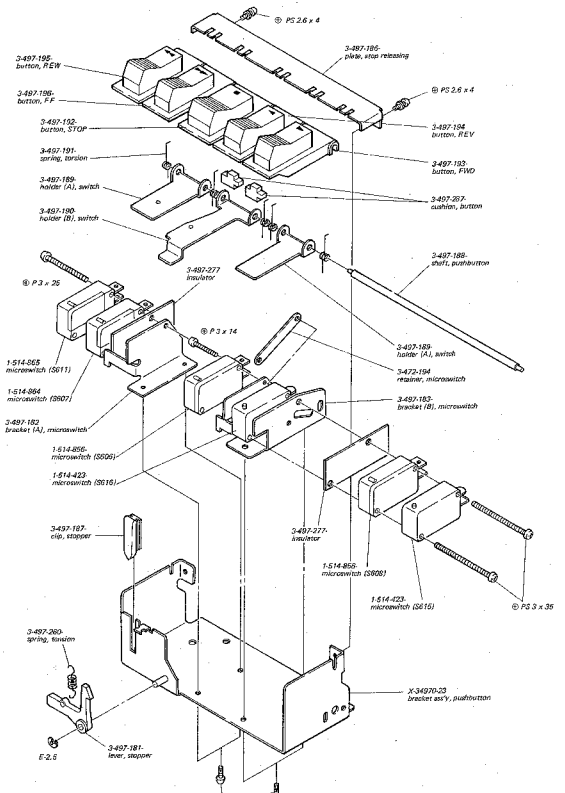


Fig. 1 Function selector

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